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VIEWS, NEWS AND INTERVIEWS.

One of the very successful telephone companies of the world, about which little is heard, is the Bermuda Telephone Company, Limited, which covers the island of Bermuda in the Atlantic Ocean, about 700 miles east of Charleston, S. C. Mr. R. A. Ferguson, brother of Mr. James Ferguson of the Municipal Electric Light Company, of Brooklyn, is the capable and successful manager of the Bermuda Telephone Company. This company has 230 subscribers, and the rates per year are: For business houses, £8; for residences, £6. There are no toll rates on trunk lines. For running wire to a subscriber they charge 50 per cent of the cost outside of a one-mile limit from any central office. There are three central offices. The head office is at Hamilton, and central exchanges are at Hamilton, St. George's and Somerset. The company have about 800 miles of wire up and have instruments in the different offices, hospitals, etc., of the British Army and Navy. Operations were begun in 1887. The company has a splendid dividend paying property, and the service is quite popular with subscribers.

John P. Cuddy, a farmer of Baltimore County, Maryland, died on March 10, in his 88th year. Mr. Cuddy made the first trip on Peter Cooper's locomotive over the B. & O. on August 28, 1830. He was also present when Professor Morse sent the first telegraphic message over the B. & O. wires between Baltimore and Washington.

General Manager Young, of the Consolidated Traction Company, of New Jersey, proposes to unite the trolley lines from Orange, N. J., with lines in cities and towns on Long Island. He has submitted the plan to the directors of the company, and, if it meets with their approval, it will be put into effect early in the Summer. The connecting link will be the boats of the Brooklyn Annex Ferry. The plan is to lay tracks from the Consolidated Traction Company's terminus in Jersey City to the ferry slip, wire the boats, and lay tracks in each gangway. The Brooklyn Heights Railroad Company will lay similar tracks to the ferry slip at the foot of Fulton street. By this means cars from the Oranges may be run, without change, to any point on the 250 miles of track on Long Island. It is not proposed to use the system at present for ordinary traffic, but for the accommodation of trolley pleasure parties. The two gangways of the ferry-boats will accommodate 10 trolley cars.

Do the people want to know about the result of the prize fight? One telephone in the *Journal* editorial room answered 519 inquiries between 1.30 and 5 o'clock yesterday afternoon. This is the record made by Manager Eiche, of the Nebraska Telephone Company. It is believed to be the largest number of calls answered by any single telephone since the Lincoln exchange was established. It was the limit of service to be had from one instrument. It is believed that had another telephone been available the number of calls would have been doubled. Nearly a score of the calls that did get in were from out of the city. These are the facts concerning the interest in prize-fight news in Lincoln. Moralists and scientists may find it a source of profitable study. — *Nebraska State Journal.*

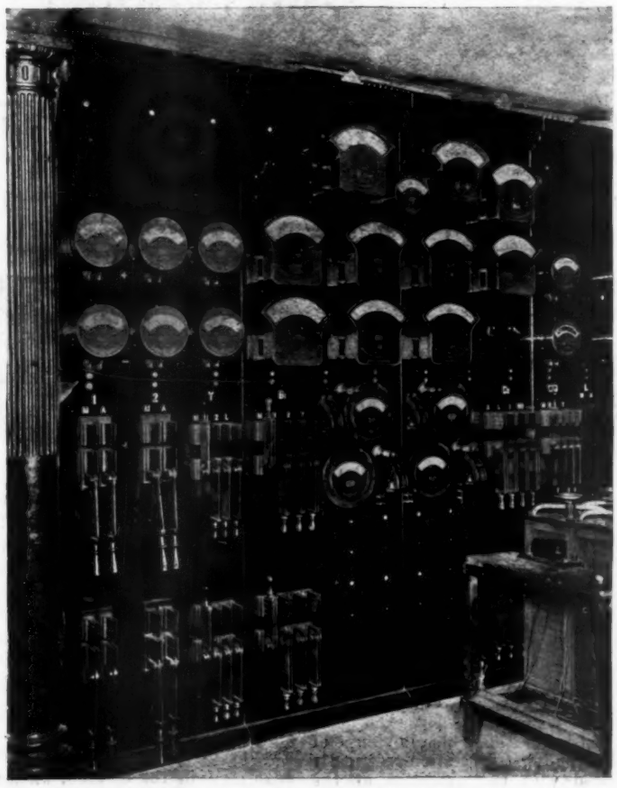

FIG. 1.—"STORAGE BATTERY PLANT IN A BROOKLYN LIGHTING STATION."—SWITCHBOARD FROM WHICH STORAGE BATTERIES ARE CONTROLLED. EQUIPPED WITH WESTON INSTRUMENTS.

STORAGE BATTERY PLANT IN A BROOKLYN LIGHTING STATION.

AN INTERESTING ACCUMULATOR INSTALLATION IN THE SECOND DISTRICT STATION OF THE EDISON ELECTRIC ILLUMINATING COMPANY OF BROOKLYN, N. Y.

There was recently installed in the second district station of the Edison Electric Illuminating Company of Brooklyn, N. Y., a battery of chloride accumulators, which possesses many points of interest, especially as concerns the regulation and control of the battery from the main switchboard. The Edison company's second district station is located at 26 Lexington avenue, and is a substantial brick structure, formerly one story high. When the storage battery equipment was installed, a second floor was set into the station, supported by iron columns, and on this the chloride accumulators rest. A general view of the battery room is shown in Fig. 3. (See page 159.)

The battery equipment consists of 160 cells of chloride accumulators of a modern type, supplied by the Electric Storage Battery Company, of Philadelphia. These have a capacity of 8,000 ampere hours. The batteries are furnished with positive plates of the Manchester type and chloride negatives. On each side of the circuit 51 cells are permanently connected in series. The cells numbered between 51 and 80, on both the positive and negative sides, are independently connected so that any load, possible to be supplied between 51 and 80 cells, may be carried with easy regulation, that is, one cell on either side of the circuit may be thrown in at a time.

From midnight until the station load begins to rise in the afternoon the storage battery plant is used as a regulator. From about 4 P. M. until midnight the storage battery carries the peak of the station load. The means of regulation and the adaptability of the plant are so flexible that it becomes an especially valuable

adjunct in cases of emergency or unusually light or heavy loads.

The apparatus used for regulating the battery current is shown in Fig. 2, and is located behind the gallery, shown at the left of Fig. 3. In a general way, this regulating apparatus consists of two longitudinal copper bus-bars; one a common bus-bar with which all the cells are connected; the other bus-bar performs a special function. In front of each of these bars is a long threaded steel screw to which a one-half horse-power Lundell motor is connected by worm gearing. An insulated nut travels on the screw thread. To this nut two super-imposed spring contacts are attached, the upper one of which is in constant contact with a brass rail, electrically connected to the bus-bar; the lower of the two contacts travels along another brass rail, which is broken at intervals, corresponding in number to the number of storage batteries connected with the bus bar. The object of the two bus-bars is to enable the batteries to be discharged at two different pressures, should such an emergency arise.

The operation of this regulating apparatus is accomplished entirely from a switchboard located in the dynamo room on the floor below, and which is illustrated in Fig. 1. Weston voltmeters and ammeters are used on this board. The four central panels carry the instruments and switches used with the storage battery plant. Just in the center will be observed four reversible switches of small size. To each circuit, controlled by these switches, are connected two 16-candle-power incandescent lamps placed in series. One of the lamps is located on the switchboard, at the side of the reversing switch, and the other is located near the regulating apparatus in the gallery. When the demands of the load on the storage batteries show that it is necessary to cut in one or more additional cells, the reversing switch is thrown up. This cuts in the two lamps, each of which begins to glow at half its rated candle-power. At the same time the Lundell motor is thrown into circuit, the screw thread is revolved and the traveling nut is carried forward. While the lower spring contact on the nut is in touch with its portion of the brass rail, previously referred to, the lamp at the switchboard and the lamp in the gallery both glow. As soon as the nut has traveled so far that the lower spring contact meets a break in this rail, the lamps cease glowing. When the man at the switchboard observes that the lamp at the side of the switch has gone out, he places the reversing switch at normal. The extinguishing of the lamp is a visual signal to him that one cell has been cut in. After the switch is once thrown, with the object of cutting in a cell of battery, the apparatus will continue to perform its functions until the switch is brought to normal, or until the full complement of batteries is thrown into circuit. If it is desired to cut out cells and reduce the voltage of the battery, the reverse operation is performed; that is, the reversing switch is thrown down.

The arrangements for charging the storage-battery plant are very complete, owing, chiefly, to the simple, yet effective, method of switch-board connections used. The charging may be accomplished in any one of five ways: First, the entire battery equipment may be charged from a "booster" located on the dynamo room floor; second, the "booster" and one of the station machines may be thrown into series; third, the battery may be charged from a station machine alone; fourth, the battery may be charged from a machine located in either one of the Edison company's other stations; fifth, the "booster" may be thrown in series with a machine in either one of the other district stations.

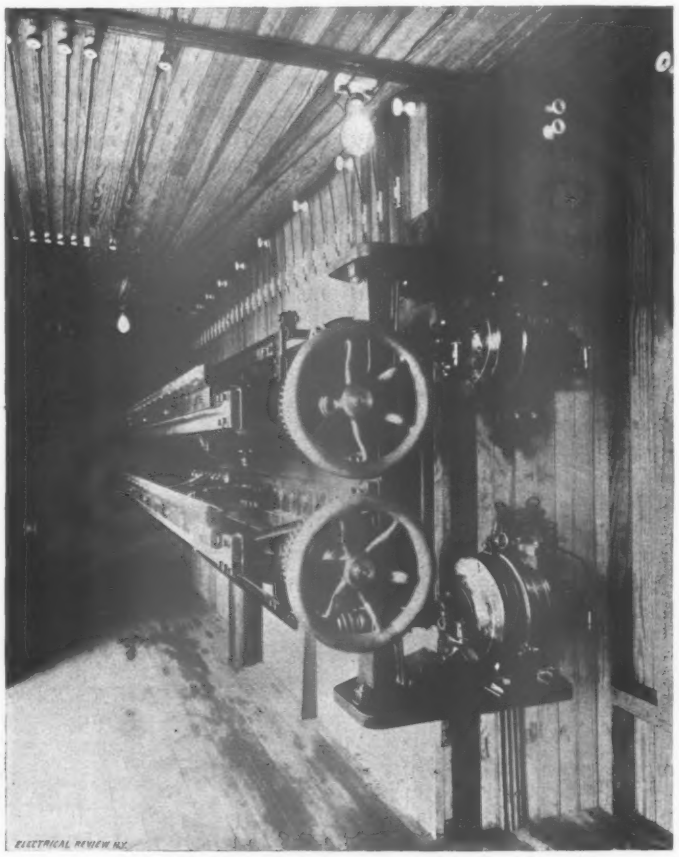

FIG. 2.—"STORAGE BATTERY PLANT IN A BROOKLYN LIGHTING STATION."—APPARATUS FOR REGULATING BATTERY CURRENT.

There is now being installed, in connection with this plant, a set of voltmeters in combination with cross-connected circular-contact switches, by means of which the voltage of any individual cell may be instantly observed. This apparatus is located in the dynamo room near the main switch-board. The men in charge of the second district station are greatly pleased with the operation of the storage battery plant, and say that it has not given the slightest trouble since the day it was put in service. While at the first glance the regulating apparatus may appear complicated, it is, in reality, extremely simple, and performs its delicate functions in a manner which seems almost human. Mechanically and electrically the regulating devices are of the highest type of construction, and, except in cases of unusual emergency, require no attention whatever. Both the Electric Storage Battery Company and the Edison Electric Illuminating Company of Brooklyn should be, and doubtless are, well pleased with this installation.

ELECTRICAL REMINISCENCES — THE WORK OF THE PIONEERS.

BY WALTER P. PHILLIPS.

The first time I ever heard of the telephone, an operator in the Western Union Telegraph Company's office, in New York, whose father was a preacher in Canada, received a copy of a Brantford newspaper, in which it was stated that a man named Alexander Graham Bell had transmitted speech by wire from Brantford to a neighboring town. It seemed incredible, but our telegraphic comrade called attention to the circumstance that his father was a godly man, and as he had said in an accompanying letter that he heard it done with his own ears, we held our peace. The newspaper announcement, however, made no impression on the public, and a year or more afterward, when Professor Bell came to New York to demonstrate that he could telephone from that city to Brooklyn, not more than a dozen out of a hundred invited guests appeared at the St. Denis Hotel to witness the experiment. I was one of the dozen, and we were unanimous in the opinion, when the experiments were concluded, that the whole thing was a toy, if not an absolute humbug. Professor Bell met with many discouragements, but obstinately pursued his experiments, and made sufficient improvements in his apparatus to have a proposition for the adoption of his invention by the American District Telegraph Company seriously considered. He wanted, if my memory serves me well, the sum of $5,000 per annum for the exclusive use of his American rights, that rate of payment to continue during the life of the patents. This was soberly considered by the board of directors, and they solemnly resolved that, the telephone being rather in the nature of a novelty, it would not be consistent with the dignity of their company to associate it with so serious a business as that involved in the delivery of messages, letters and parcels by uniformed messengers. Professor Bell was forced to seek other alliances, and you have seen the result.

The telegraph of the long ago, which would not yield in Harrisburg money enough to pay the board of a man who has since shown himself to be great, and who at that time combined in himself the position of operator, lineman, battery man, messenger and manager, is as much an essential in our daily life to day as are the railroads, the steamboats and the mails. The Atlantic cable, almost wholly disused for two or three years, is as freely employed now as are the land lines. The invention that the American District Telegraph Company, of New York, rejected, because it seemed only a trifling thing, has been perfected to a degree admitting of easy conversation between points as far distant as New York and Chicago. Great fortunes have been amassed out of each and all of these different mediums of communication, and the welfare of man has been greatly enhanced by them. And yet, difficult as it would be to day to transact business without them, none of them was adopted without a struggle in which progress battled with prejudice, but out of which progress happily came forth a gallant victor.

Everywhere in this country, where newspapers of any size are published, they are served with the telegraphic news of the world over wires leased for that especial purpose, and operated by men selected with a particular view to handling press reports in a rapid, efficient and intelligent manner. This condition grew out of the leasing by the New York Associated Press of a wire between New York and Washington in 1875. Mr. Orton predicted a failure, and he combated the idea and delayed action on the proposition for years. But he finally yielded, with the assertion and expectation that the experiment would be a failure. But it was not, and wires to Boston, to Buffalo, and finally to Chicago, were soon called for by the various press associations, until, as I have said, the leased wire system is now almost universal. It was my good fortune, as one of the lieutenants of the late James W. Simonton, to select the men to work that pioneer leased wire from New York to Washington. There were eight of them, two each at New York, Philadelphia, Baltimore and Washington, and I am glad to be able to say that after 19 years they are all alive and well, and that all of them are still in the press service. These eight men founded a system, and are worth knowing, if only by name, for they made an assault and carried a position against the prejudice of a great telegraph company, its officers and employés.

Besides, there were never eight men who could telegraph better than Fred N. Bassett, P. V. De Graw, W. H. C. Hargrave, W. G. Jones, Thomas J. Bishop, H. A. Wells, W. N. Gove and E. C. Boileau. I have mentioned Boileau last, because he was first of all, if there were any choice among them.

"Nothing is so unpopular as an innovation," said Bishop Potter. I think he spoke the truth.

No man shall excel me in a quick perception of what has been done to increase the value of human life and the sum of earthly happiness by the painters, the sculptors and the writers of books and music. Nor do I forget how much we owe to Howe, whose invention brightened the hard lives of the women who were compelled by circumstances to ply the needle far into the night; to Stevenson, whose efforts to compass land locomotion by steam have eventuated in our being able to travel luxuriously from New York to Chicago in the incredibly short space of 20 hours; to Fulton, whose uncouth steamboat, worrying noisily through the glad waters of the storied Hudson, has been succeeded by floating palaces in which we cross the seas; to Hauy, who created a system enabling the blind to read; to the Gallaudets, who have perfected a sign language for the deaf, and a system of articulation for those hitherto deemed to be dumb, or to the hundreds of men and women who have made the world happier, wiser and better for having lived in it. Like the royal wanderer amid the leafy woods of Arden, who heard sermons from stones, music in the whispering of the trees, and who found books in the running brooks and good in everything, so I, scanning the names upon the scroll of fame, feel to the full how much the world owes to its conspicuous men and women. They listen to the sermon-yielding stones, and they know the truths written in the books found in the running brooks. In short, they have found and inculcated upon mankind that good resides in everything. And yet, useful as is the sewing machine, grand as have become in their practical application the dreams of Stevenson and Fulton, much as we are indebted to the beneficent brotherhood of philanthropists and to the pioneers in pushing onward the car of progress, the men who have added the final touch to the magnificent development of the last 50 years have been they who, building upon the discovery that electricity could be made a ready servant, gave us the telegraph, the ocean cable, the telephone, the trolley car and a light rivaling the sun itself—an artificial radiance more beautiful than the mind of man could imagine 50 years ago—a light which it seems to me has touched the zenith for both utility and splendor.

Therefore, to retrace my steps and return after this desultory wandering away from it to my original proposition, I am justified, I think, in view of how and by whom electricity was first made captive, and considering the man who has been most conspicuous in making and in suggesting applications of it in so many unexpected ways—I am justified, I say, in asserting that any man should be proud that he was once a printer, as Benjamin Franklin was, or that his hand once knew and still retains, perhaps, the cunning that was learned in the rugged school of telegraphic experience, in which Thomas Alva Edison was also a pupil.

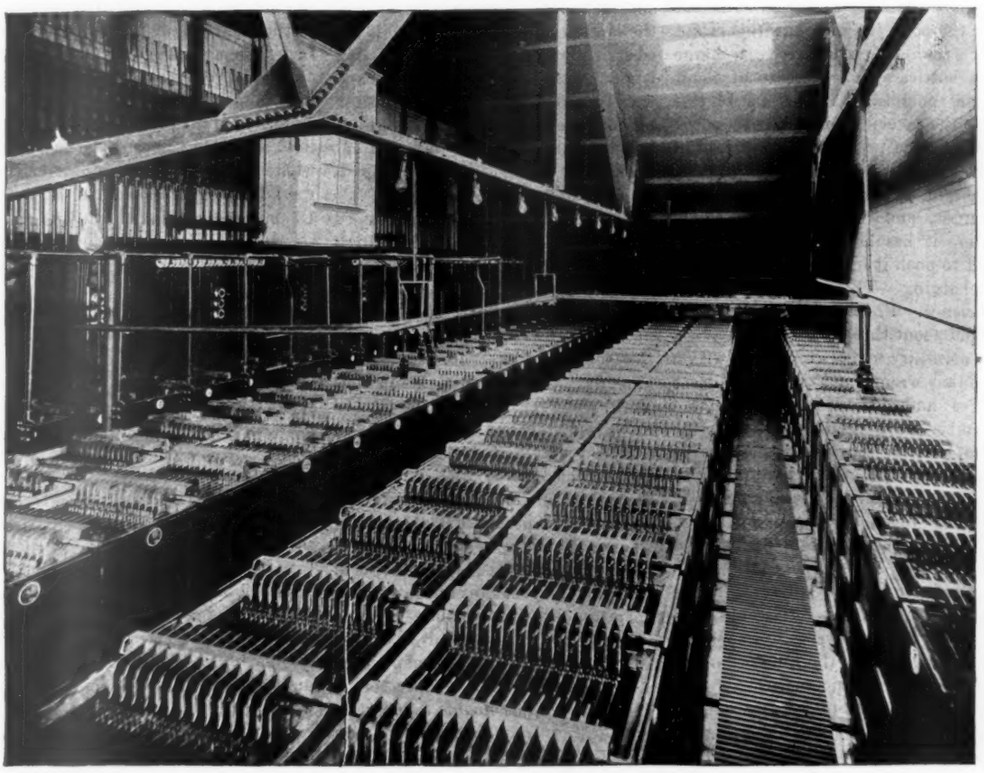

FIG. 3.—STORAGE BATTERY ROOM IN THE SECOND DISTRICT STATION OF THE EDISON ELECTRIC ILLUMINATING COMPANY OF BROOKLYN, N. Y.

Armorite Conduit To Be Made in England.

The Armorite Interior Conduit Company, of Detroit, Mich., has just completed arrangements by which its well known product will be manufactured in England, under patents already granted. Mr. R. H. Kilby, a prominent English iron manufacturer, sailed for home last Saturday with full authority to establish an armorite conduit plant near Birmingham, England. This plant will be located within carting distance of the plant which will supply the iron tube used in making armorite conduit.

The conduit machinery will be made in the United States and shipped to England. It is expected that within a very short time armorite will be placed on the English market, where it will doubtless achieve a popularity as great as it now has in this country. The ELECTRICAL REVIEW congratulates the Armorite Interior Conduit Company on its rapidly extending business.

New Offices for the Sterling Supply Company.

The Sterling Supply and Manufacturing Company, of this city, the well known manufacturers of street railway supplies, have just removed to much larger and more commodious quarters, in the Lexington Building, 141–155 East Twenty-fifth street. This building is a notable one, and particularly well adapted for the purposes of this enterprising company, who were compelled, by the rapid increase in business, to secure greatly enlarged facilities. Mr. J. H. Carson, president of the company, and his energetic staff are to be congratulated over the success the Sterling products are meeting with in all directions, and the ELECTRICAL REVIEW extends its best wishes for continued and increasing prosperity.

PERSONAL.

Mr. Stanley S. Stout, of Chicago, counsel for the Western Telephone Construction Company, visited New York last week.

Mr. Morris W. Mead, chief of the electrical bureau of Pittsburgh, was among the out-of-town visitors to New York city last week.

Mr. Wm. Habirshaw, of the India Rubber and Gutta Percha Insulating Company, New York, was among the Chicago visitors last week.

Mr. John A. Brill, the well known street car manufacturer, of Philadelphia, sailed last week for Europe on a visit combining business and pleasure.

Mr. James F. Cummings, of Detroit, president of the Armorite Interior Conduit Company, arrived in New York city the latter part of last week.

Mr. Henry B. Cutter, of the Cutter Electrical and Manufacturing Company, Philadelphia, spent several days in Chicago last week on business connected with the well known Cutter specialties.

We notice that the name of Dr. F. A. C. Perrine, of Leland Stanford University, now appears as one of the editors of *Electrical Engineering*, of Chicago. This magazine will hereafter appear twice a month, instead of monthly as formerly.

Mr. B. J. Arnold has returned to Chicago from his recent trip to the University of Nebraska, where he gave a series of 10 lectures on electric light and power stations, under the auspices of the university's department of electrical and steam engineering.

President G. A. McKinlock, of the Central Electric Company, who has been absent from Chicago during the past month, taking an extended trip throughout the southern States, returned last week, but only remained long enough to shake hands with a few callers and dispose of the most urgent business matters awaiting his attention, after which he immediately left for the East on business requiring his presence.

Mr. H. M. Littell and family sailed last week for Europe for three months' sojourn in Great Britain and on the Continent. Mr. Littell, who is the vice-president and general manager of the Metropolitan Street Railway Company, makes the trip partly on account of the poor health of his wife and also because of a personal need of a vacation after his arduous Winter's work in the street railway field in New York city.

The following named out-of-town visitors registered at the headquarters of the National Electric Light Association, 136 Liberty street, New York city, for the week ending April 2: A. E. Carrier, Pittsburgh, Pa.; Manuel Brunet and Miguel Garcia, Havana, Cuba; D. D. Dickey, Pittsburgh, Pa.; Frederic Nicholls, Toronto, Ont.; A. J. Belden, Syracuse, N. Y.; N. H. Jones, Cleveland, Ohio; R. T. Robinson, Norfolk, Va. This was President Nicholls's twelfth visit to New York on association business since his election, making over 12,000 miles traveled by him in the interests of the association.

COMPRESSED AIR FOR STREET RAILWAY SERVICE.

A CRITICISM OF GENERAL HAUPT'S ASSERTIONS.

To the Editor of Electrical Review:

In an interview with General Haupt, which appeared in the New York *Sun* of March 28, he discusses the question of the use of compressed air for traction purposes. A careful examination of this interview would lead to the conclusion that General Haupt is discussing the matter, not from the point of view of an engineer, but rather from the point of view of one desirous of promoting a financial scheme, which must inevitably result in failure.

The history of the use of compressed air for traction purposes began a good many years ago, and Germany, France and England were in turn bitten by the craze, but the matter, having been investigated by the most practical engineers there, has been by all rejected. It has recently made its appearance in this country, and there is not the slightest doubt that the same rejection awaits it here.

A car fitted with compressed air apparatus is nothing more than a heavy reciprocating locomotive with a number of moving parts and a multiplicity of joints from which the compressed air, under the pressure at which it is utilized, can and does leak. General Haupt's claim for perfection for the air motor is belied by results obtained with air motors, and he could not have fully acquainted himself with their performances when he made such a claim.

The air is stored in a number of bottles or cylinders, made of Mannesmann steel. He claims that if the pressure breaks the bottle, it merely splits it and opens it. General Haupt must have heard of the recent experiments with steel bottles, and two violent explosions are on record; one blew the bottle into fragments, with the sound of a cannon, and pieces were found two blocks away; the second blew up a car, burst through six-inch oak sills and almost tore the roof off. So much for that assertion.

In a recent interview with M. Abdank, one of the best known railway engineers in France, he asserted that he had seen several explosions of air motors under pressures of about 750 pounds to the square inch, with disastrous results. Under the system recently brought forward, a pressure of from 2,000 to 2,500 pounds is used. What American would hazard himself in a car immediately over such a pressure, which is more than 12 times that of the steam in an ordinary steam locomotive? The margin of safety, in view of the explosions referred to, is no guarantee against similar disaster.

Each air-motor car must carry a constantly burning flame to reheat the air. Now, General Haupt's assertion that freezing is less likely to take place with a high pressure than with a low pressure is falsified by the fact that the lowness of the temperature depends upon the amount of expansion from high pressure in the bottles to low pressure at the locomotive cylinders, and this flame must be kept constantly burning, with all its risks, to prevent freezing. Furthermore, even with the flame, the exhaust so frequently freezes that the cars have not only come to a stop themselves, but have blocked the whole line and have had to be pushed home.

Experience with air cars shows that the numerous joints, unions and valves, absolutely necessary, provide each a means of leakage for the air. On the first trip of a motor car the bottles are charged to about 1,800 pounds and come back with about 300. It might be supposed that a charge of 1,500 pounds pressure would be sufficient for the next journey, but this is not the case. It is necessary to recharge the bottles with a pressure of about 2,200 pounds. At the end of this trip the car will come in with about 100 pounds pressure, and, instead of recharging the car with 2,100 pounds, the pressure is made about 2,500 pounds, and when the car comes home it has hardly enough pressure left to push it into the car house for recharging. This is from actual experience. Frequently the cars will stand about three trips, after which it is necessary to go over them with a monkey wrench and tighten up every valve and joint anew, as a large number have been loosened by the reciprocating pound of the moving parts and the ordinary vibration of the car. When valves and unions can be made to stand a pressure of 2,500 pounds to the square inch and hold the air we may hope to see compressed air motors which will give satisfactory service, but it has confessedly taken the Hardie people 20 years to develop their motor, and if they have only succeeded so far in obtaining, as a result, the compressed air motor now put out under their name, we can only look upon it as one more failure to be added to the list.

The assertions in the interview have all the marks of those of the promoter—general assertions without scientific weight. General Haupt says there is no loss in transmitting compressed air. This depends entirely upon the distance it has to be transmitted. He gives the loss in compression of air and carefully minimizes it. He also asserts that this is almost entirely regained by reheating, but in this case he carefully omits to state what percentage of the loss is regained.

Regarding the assertion that compressed air cars compare favorably with electric cars, there is but one answer; that is, if the French found compressed air cheaper, why did they throw compressed air out of the Versailles line and put in the trolley? If the Metropolitan Traction Company, of New York, which can not certainly be accused of any sentimental predilections, found compressed air economical, why did they reject it and put in underground electrical conduit? If the Third Avenue company found compressed air motors cheap, why did they adopt electricity for their Kingsbridge extension?

General Haupt can probably procure figures showing results of compressed air when compared with cable or electricity, but he may not be able to so easily explain why the operation of the air costs about twice as much as the cable, and even more than that for the electric car. From the point of view of the electric railway engineer, the air-motor system is neither as cheap, as effective, as reliable, nor as efficient as the electrical system. In the cost of maintenance, the compressed air system is very much more expensive than the electrical system. The electric car is under much better control than the compressed air car; the motion of the armature of the electric motor is perfectly even, and is much less severe on the axles and wheels and track than any piston motion where the wheels are counterbalanced to offset an intermittent horizontal motion changed into a circular motion.

The difficulty with the compressed air system is that experimentally it would seem to realize the theories expressed, while in actual service it is a complete failure, and perhaps nothing could prove this more than the fact that a 200 horse-power engine, during the experiments in New York, was kept going all the time in order to merely run two cars.

It is a matter of surprise that the *Sun*, which has at its command so many scientific men, should have lent itself to this promotion interview of General Haupt's.

It may be asserted, without fear of contradiction, that any railway system operating with automobile cars—in which every foot the car is moved decreases the power at command, even allowing a margin of 50 per cent—will be absolutely unable to maintain its schedule, and this under the most favorable conditions. Given such conditions as prevailed in New York this Winter—heavy snow falls and cold, frosty days—the chances are that the compressed air system would be brought to a complete standstill.

Lastly, any railway system contemplating a change of motive power has merely to insist on the production of records. It can then secure satisfactory proof that the electric motor in transit service has nothing to fear from compressed air.

Experience.

New York City, March 31.

The Electric Potential.

The Electric Potential will hold its annual meeting at Young's Hotel, Boston, on Wednesday evening, April 7, 1897. Dinner will be served at 6.30. Immediately following the dinner a few minutes will be devoted to election of officers, after which the important and interesting topic of the evening, "Electricity at Niagara Falls," will be presented by C. F. Scott, of the Westinghouse Electric Company. The lecture will be amply illustrated by the stereopticon and models.

THE DEFLECTION OF BULLETS BY ELECTRIC CURRENTS.

INTERESTING EXPERIMENTS.

The committee of the Federal Shooting Association, of Switzerland, while target shooting at Winterthur, noticed that targets at the left side of the range received a majority of bullets to the left of the bullseye, while the reverse was the case on the other side of the range, says the New York *Sun*. Some quick-witted member of the committee suggested that this apparent deflection of the missiles might be due to the electric telephone wires, which chanced to be strung on each side of the range. The matter was brought to the attention of the Federal experimental committee, who found that all projectiles that had been deflected from their course were magnetized.

The theory of electrical action being thus supported, experiments were undertaken to put the question to a final test. At the range near Thun, where no electric wires were in the way, four experimental wires, each 18 millimetres in diameter, were strung parallel to the line of fire, and 125 feet away from it. Paper screens were then fixed at intervals of 30 feet along the range, to indicate the exact course of the bullets. An electric current of 8,000 volts being sent through the wires, its influence was unmistakably shown by the course of the bullets fired from the military rifles. At 275 yards the deflection of the bullets from the straight course was no less than 75 feet, "the trajectory, as marked by the paper screens, showing a very remarkable curve toward the wires".

When a trial was made with a Japanese rifle, the invention of Col. Yamagata, which throws a very slender bullet, the results were even more startling, as the "minute bullet went straight for the wires, broke two insulators, and followed along the course of the electric wires, finally wearing out its energy with the friction".

The effect thus being more pronounced with small missiles, it was presumed that a cannon ball would be unaffected. But a trial proved this assumption a mistake, for on a 3,000-yard range, the wires being strung only for a distance of 200 yards in front of the target, and at the same lateral distance as before, the cannon ball was deflected no less than 14 degrees. With shrapnel (an explosive shell filled with musket balls) the effects were even more curious, as the projectile carrying the fuse made of non-magnetic metal was completely detached, while the body was attracted by the current, "the bullets, after the shell burst, showing such extraordinary variations that all accuracy of fire was totally done away with".

The general results of the entire series of experiments was to show that, as might be expected, the deflecting power of the current was proportionately less when large missiles were used, and varied also with the velocity of the missiles.

Automatic Circuit Breakers.

Fuse wire has proved so unreliable to all users and electrical engineers as a safety device for protection from short circuits, overload or grounds, and offering no protection from lightning storms whatever, that the electrical public has turned its attention to the use of automatic magnetic circuit breakers as a reliable substitute for fuse wire.

The accompanying illustrations show the well known automatic circuit breakers, or limit switches, made by the Automatic Circuit Breaker Company, Newaygo, Mich., with their latest improvements. Fig. 1 shows the circuit breaker closed; Fig. 2, circuit breaker open, or as it appears after circuit is broken; Fig. 3, sectional view, showing on a line drawn through center of instrument.

Y represents base—either marble, slate or other suitable material; preferably slate. A, copper contact; B and B1, carbons upon which they make their final break; C, dash-pot that gives break frame its sudden blow through handle V, which has use of magnetism, being points F and G, which is always positive and never varying in principle or operation.

The Automatic Circuit Breaker Company make a positive guarantee that their instruments will operate within one per cent of their set capacity under any and all circumstances. They have them in use on all systems and voltages, and claim to manufacture the only successful alternating-current circuit breaker now on the market. They attribute a great share of their success to the fact that they send out one or a full equipment to their customers, subject to approval, and if not entirely satisfactory to them in every way, they are under no obligations to them, excepting to promptly notify them, so that they can send shipping directions for the return of the instruments.

Visitors to Bermuda.

The British island of Bermuda has been a popular resort of a number of electrical people during the last few weeks. Among the guests at the well-managed Hamilton Hotel, at Hamilton, Bermuda, have been Mr. W. C. Bryant and wife, of Bridgeport; Mr. Oliver Ames, of the General Electric Company, and wife, of Boston; Mr. W. L. Candee and wife, of New York, and Dr. S. S. Wheeler and Mrs. G. G. Ward and son, of New York. Mr. J. Seaver Page, trustee of the Brooklyn Bridge, and daughter, and Mr. Joseph Howard, Jr., the distinguished journalist, and wife, were also guests of the Hamilton, at Bermuda.

Mr. L. G. Martin is the manager at Bermuda of the Halifax & Bermuda Cable Company, Limited, which is allied with the Commercial Cable Company, of New York. A party of electrical visitors to Bermuda recently were most hospitably entertained by Mr. and Mrs. Martin, and carried away delightful recollections of their visit through these courtesies. Mr. Martin, who is a capable electrical engineer, is particularly interested in the study of the latest instruments relating to the field of ocean telegraphy.

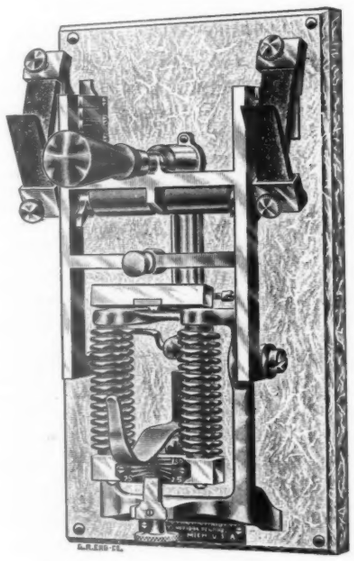

FIG. 1.—AUTOMATIC CIRCUIT BREAKER, CLOSED.

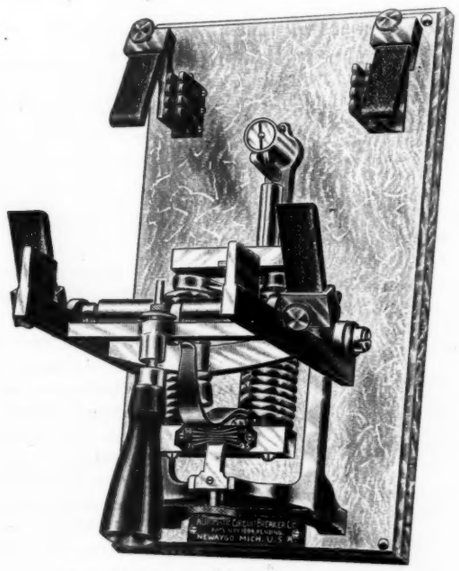

FIG. 2.—AUTOMATIC CIRCUIT BREAKER, OPEN.

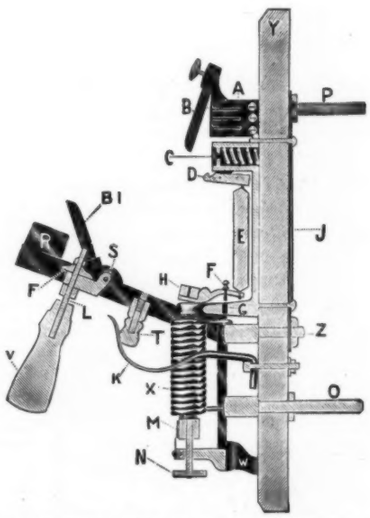

FIG. 3.—SECTIONAL VIEW OF AUTOMATIC CIRCUIT BREAKER.

about one-eighth of an inch play, as shown at L, so that it gives break frame a hammer blow, overcoming any possible chances for contacts R and A sticking; D, latch; E, small weight to return armature to place after instrument has operated; F, screw through armature holder, making contact on point shown at G, which is a piece of iron running to magnet core, and is magnetized so that it holds armature up until current exceeds the predetermined point. Then magnet G releases screw F, giving a hammer blow to E against latch D, and releases disk F, which is the catch on frame R, and a part of handle V, all movements being positive knock-out blows; M is the graduation plate, graduations being in amperes; N, adjusting screw for adjusting capacity, either increasing or decreasing to any predetermined point between the minimum or maximum graduations. The manufacturers have displaced all springs and intricate parts by a new and novel

TELEPHONE NEWS AND COMMENT.

The instrument statement of the American Bell Telephone Company, for the month ended March 20, is as follows:

	1897.	1896.	1895.
Gross output	19,192	19,283	12,534
Returned	6,495	7,331	5,493
Net output	12,697	11,952	7,041
Since December 20:			
Gross output	53,309	54,993	31,363
Returned	20,911	22,132	18,972
Net output	32,398	32,861	12,391
Total outstanding	806,247	709,397	594,897

In the case of the Postal Telegraph and Cable Company, of Orange, Tex., against the Southern Pacific Railroad Company, for right of way for their line from the Sabine River to Houston, the jury awarded the Southern Pacific $1,500 damages. The Postal Company will apply immediately for a new trial, as they consider this amount exorbitant.

The Empire State Telephone Company is about to introduce in Geneva, N. Y., what is called the "select party system". It will be used on a metallic circuit, long-distance transmitter, which will be positively non-interfering, and will be furnished to subscribers at $30 per year for local use and the privilege of using toll lines reaching all parts of the State. Patrons can then talk from their residences or business places fully as well as from the central office.

The Central Union Telephone Company has pay stations in different parts of Toledo, Ohio, where collections for long-distance service are made automatically. Each of these machines gathers considerable money in the course of a week. Just before the last hour of collection, the other day, thieves went through the boxes, tore off the hasps and carried away the contents. One of the stations is in the American District Telegraph office, within a few feet of all-night operators. The lock was twisted off and the drawer pried open with a jimmy. The station box in the Produce Exchange was treated in the same manner. At the Boody House, the leading hotel of the city, the outside padlock was broken off. At the Burnett House the cash-box was pried open after the lock had been twisted with a pair of pliers. Steel cash-drawers will hereafter be used by the telephone people. This is believed to be the first robbery of the kind on record.

The last subscriber was changed on March 25 on the Utica exchange of the Central New York Telephone and Telegraph Company from the overhead to the underground system, and on that day a meeting of the division superintendents was held in Utica. At three o'clock in the afternoon, C. A. Nicholson, general manager of the company, made this connection, subscriber No. 1565, the Oneida National Bank, being the one changed. The first change was made from the overhead to the underground system on December 14, 1896, telephone No. 1210, C. A. Nicholson, general manager, being the subscriber. The company has now completed its subway system in Utica. The last change has been made, and the next step is the placing of a new and modern switchboard, which will take care of any future growth of this exchange. The changes were made from overhead to underground without the least interruption to the subscribers, as can be testified to by one gentleman, who called up Mr. George W. Wood, the manager, and asked him when he was going to be changed to the underground system. Mr. Wood replied that he had been working through the underground system for the past two weeks. Everything works nicely and the company are much pleased over the fine working of the lines through the subways.

At the annual meeting of the Claremont, N. H., Electric Light Company, the following were elected officers: President, Ira Colby; secretary, C. B. Spofford; treasurer, E. J. Tenney. Directors, Ira Colby, G. H. Stowell, E. J. Tenney, F. P. Maynard, C. B. Spofford, H. R. Beckwith, I. D. Hall.

Electrical Review

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, APRIL 7, 1897.

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Referring to the recent ruminations of the ELECTRICAL REVIEW's burglar editor, one of our esteemed contemporaries seems to be in doubt as to whether or not the electric arc can burn a hole through a safe wall within the time named and without "blowing every fuse in the district". We understand that Professor Pumpelly, of Chicago, can furnish a battery, that will not weigh over 300 pounds, which will do the business.

LICENSING ELECTRICAL CONTRACTORS.

There is now before the City Council of Chicago an ordinance, which, if passed, and the probabilities are it will pass, will, to a great extent, do away with the many evils resulting from defective or improper electrical wiring and construction, which, in spite of the most stringent rules and most efficient "inspection", have occurred there and elsewhere, and which so often have been the source of acrimonious debates and lengthy controversies between the fire underwriters or insurance interests on one side, and the owners and operators of electric light and power plants on the other. While it is no doubt true that there has been, and probably is still, cause for complaint on each side, it is also a fact that until within the last few years only desultory attempts have been made, on either side, to strike at the root of the evil by having the proper authorities license and control electrical contractors, wiremen and operators of electrical machinery.

Chicago is, we believe, the first city to take definite action in the matter, and other cities will, no doubt, follow the example of the western metropolis. The ordinance provides, in brief, as follows:

Section 1 makes it unlawful for any person, firm or corporation, to engage in the business of installing electrical machinery, electrical apparatus, or electrical construction work of any kind whatsoever, for the purpose of furnishing light, heat or power by means of electricity, within the city of Chicago, without first having obtained a license therefor, as specified further, and paying therefor an annual license fee of $50. The license is to be denominated "Electrical Contractors' License". Paragraph 2, of this section, imposes a license fee of $2 per annum on all employés of contractors. These licenses are to be called "License for Interior Electrical Wiremen". Paragraph 3 prohibits any person from operating an electric light, heat or power plant without a "License for Operating Electrical Machinery". Such license costs $5 per annum.

Section 2 provides for the examination, by the Board of Civil Service Commissioners, of any person, firm, or corporation applying for a license under Section 1, and unless such examination is passed satisfactorily to the board a license will not be issued. Electrical contractors must give a bond of $1,000 to the city, to protect the latter from any expense or damage caused by defective work. Where a firm or corporation applies for a contractors' license, the latter will be issued to such firm or corporation after proper examination of any one member of such firm, and in the event of the withdrawal of such member from the firm a new member must qualify.

Section 3 compels contractors to first notify the proper city authorities, in writing, of any proposed electrical construction work, either original work or repairs, additions or alterations.

The moneys received from license fees shall be credited to a special fund, to be known as "Electric License Fees", out of which all necessary expenses, incurred in carrying out the provisions of this ordinance, shall be paid, the balance to be used as other revenue of the city collected in a like manner.

The penalty for violating any of the provisions of this ordinance is to be not less than $50 nor more than $100, each day during which a violation is continued to constitute a separate offence. In addition to the fine and penalty the license is to be forfeited.

IMPROVEMENT IN BUSINESS.

The ELECTRICAL REVIEW is gratified to be able to state that the business revival in the electrical field is assuming larger proportions and experiencing a more healthy growth day by day. Several of the large contracts to which we referred some months ago have been placed and others of smaller size are being placed frequently. The general improvement in the electrical business is indicated by the rapid and steady growth of the ELECTRICAL REVIEW in all departments since the first of the year. The publishing business is of the most sensitive character and quickly responds to any change in trade development. It has been many months since the news columns of this journal have been so taxed to record the occurrences of the week. This is good evidence that there is lots of business going on. Our subscription list has enjoyed a steady addition of paid subscribers, and in our advertising columns will be found many new announcements. We believe that the business crisis has been passed, in the electrical field at least, and that from now on we will all have cause to congratulate ourselves on the industrial outlook.

THE VAGARIES OF LIGHTNING.

The vagaries of lightning were again illustrated in a striking manner at Waynesboro, Ga., on April 1. A stroke killed Frank Dent, the eleventh man in a row of convicts, strung on a chain with 10 companions. The convicts were working in a field, late in the evening, when a severe storm came up. The guard quickly strung the gang upon a long chain and hustled them toward a tree. Dent was at one end of the chain, and the other end was made fast about the tree. A bright flash came, and in an instant the tree was in splinters. The current leaped from the tree along the chain. The flash blinded the gang, and when they recovered Dent was dead. Two others were badly burned.

LATE NEWS.

The Fort Wayne Electric Corporation has asked for a receiver for the Franklin Electric Light Company, of Cape May, N. J.

The Mexican Telephone Company has increased its subscribers to 2,400, and operates 20 exchanges, of which the largest is in the city of Mexico, with 1,000 subscribers.

A mortgage has been recorded at Salem, Mass., for $20,000,000 for the purchase of entire plant of the Postal Telegraph Company by the Commercial Cable Company.

The Edison Electric Illuminating Company of Boston has filed its plans to open 22 miles of streets in Boston during this year for the purpose of putting its wires under ground. There will be 99,600 feet of conduit and 148 junction boxes used.

Suit has been filed in Indianapolis for a receiver for the Indianapolis & Broad Ripple Rapid Transit Company. The heaviest creditor is reported to be the Electric Corporation, of Boston, to which the road is indebted $150,000 for equipment.

It is said that the General Electric and Westinghouse companies have been figuring on a contract to supply the electrical equipment for an underground railroad to be built in Johannesburg, Africa. The probability is that the Westinghouse company will get the contract.

A press dispatch states that Joseph McCreery, a Fall River mill man, will build a cotton mill at Depew, N. Y.; capacity, 40,000 spindles. The mill will be run by electric power from Niagara Falls. Chauncey M. Depew and John Jacob Astor are said to be interested with Mr. McCreery in the new corporation.

A permanent injunction has been issued in Judge Yerkes' Court, at Doylestown, Pa., against the Philadelphia & Bristol Electric Railway Company occupying the Bristol turnpike with its trolley lines. This apparently stops construction of the trolley road from Philadelphia to New York, as was intended.

A war that has been waged for the past three years in the city government of Fall River, Mass., has been ended by the report of Professor Swain, engineer to the Board of Railroad Commissioners, and as a result the Dighton, Somerset & Swansea Electric Railway may lay its tracks on the Swansea side of Slade's ferry bridge, and the Globe Street Railway may lay rails on the Fall River side. This will make an electric road connection from New Bedford to Taunton.

The pooled holdings of Louisville, Ky., stockholders in the Southern Electric Railway, of St. Louis, have been sold to St. Louis capitalists. The price paid for the common stock was 40 and for the preferred 82½. The buyers pay all commissions and expenses. The amount of money realized to Louisville investors will be over $600,000, which is a return of the original capital with about four and one-half per cent interest. For a long time it was thought nothing would be realized.

The boulevarding of Jackson street, Chicago, from the river to Michigan avenue, which will be done within the next 60 days, is causing all electric light and power companies, as well as all telegraph, telephone and similar concerns, to display great activity in placing their conductors or conduits in that street in such shape that any future tearing up of the pavement will be unnecessary. This is due to an imperative order from the Park Commissioners, under which the disturbance of the asphalt pavement, after once laid, is absolutely prohibited. The part of Jackson street referred to being in the very center of the business district, makes it somewhat of a problem to the companies interested to provide sufficient conduit space for meeting the possible demand for several years to come.

X Rays and the Vacuum.

To the Editor of Electrical Review:

The poor results with X-ray tubes have been so frequently attributed to the form and position of the electrodes that it is interesting to consider what proportion of these results arises from this cause, and what proportion is due to the condition of the vacuum. The careful study of many hundred tubes of all shapes and sizes during process of making and pumping has led to the conclusion that *much* depends on the condition of the vacuum, and *little* on the exact position of the electrodes.

At first it seemed a simple matter to find out, once and for all, what the degree of exhaustion should be, and then to blindly follow this rule. Such methods, however, have proven expensive, both for manufacturers and consumers.

Properly exciting the tube, while it is being pumped, is found to be the most important point, and the efficiency of no tube will long continue without careful attention to it.

Since there is so great a difference in the mechanical and heating effects produced by the various kinds of exciting apparatus, the best results can only be obtained by not only pumping the tube on the same length of spark, but also on the same kind of exciting instrument as that upon which it is to be operated. If manufacturers could be induced to give proper weight to this point, better results would be obtained, and the life of tubes would be greatly lengthened.

Very truly yours,

Boston, April 2. E. Cate.

The Chicago Electrical Association.

The next meeting of the Chicago Electrical Association will be held in Room 737, Monadnock Building, Friday evening, April 16. Mr. C. Wiler will read a paper on the subject of "Arc Lighting in America and Europe".

Mr. Geo. Bullock, president of the Bullock Electric Manufacturing Company, Cincinnati, Ohio, arrived in New York city last week.

MORSE'S TELEGRAPHIC SYMBOLS IN TRAINING THE MUTE.

BY G. P. HACHENBERG, M. D., AUSTIN, TEX.

In some recent issues of the Electrical Review have appeared various criticisms on my article on electrical training of the mute, published in the Review of January 26, 1897. The exchange press likewise contributed to ventilate the subject; in particular, those that had charge of schools for the deaf. Whatever deduction was made on the question, there was not a single idea advanced, in my opinion, in favor of the old dactylology system. Morse's alphabetic training in teaching the mute could not well be improved, for several reasons. It is the most unostentatious way of communication. It lessens the conspicuousness of the physical infirmity of the mute. It is, as our Chicago critic admitted, a system easily learned. While it advances their intellectual training, they become expert telegraphists besides. Dactylology is worth little to the pupil after he leaves school and is to take his part in civil life. His knowledge of telegraphy would open to him one avenue of usefulness he would not have otherwise. Our Boston critic (who favors our cause) in answering the above-named gentleman, hits the nail on the head by conveying the idea that the change would be more troublesome to the teachers than beneficial to the pupils. This could be easily remedied by an exchange of teachers—dismiss the dactylologists and let practicable telegraphists take their places. An Austin critic, in his school paper, thinks I don't understand the merits of dactylology. That may be so, but what has he to say of himself on electricity? There he is as mute as one of his pupils on the subject.

Dactylology is an exceedingly complicated system, and it seems doubtful if any large proportion of the pupils ever attain full mastery of it.

Gesticulation is nature's language, in a great measure among the mute, the savages, and among strangers that speak not the same language. Roscius, in his controversy with Cicero, with great success exhibited its power to portray the emotion of the heart. The mute have but an animal claim to it, to compare with what a sensitive, educated person would show. It is strongly developed in all domestic animals.

Since the publication of my first paper on the subject, and seeing a general interest excited in it, I feel that I left much unsaid.

Morse's alphabets for the mute were given by three different movements of the mouth, which express the telegraphic symbols. The pouting of the lips to give the "dot"; a slight opening of the lips to give the "short dash", and a full opening of the lips the "long dash", etc.

We give the lips as one of our means of communicating alphabets, as it is less ostentatious than any other method; but almost any other personal means would serve the same purpose. We look to the lips, as it is the main normal source of speech, and in our connection makes it a beautiful "make believe".

The index finger alone would serve an excellent purpose in open conversation. The index practice should be used as follows:

An erect elevated finger to solicit attention. To point the finger outward for a "dot"; its movement to the left for the "short dash", and the movement to the right for the "long dash". A common leadpencil may be used in place of the finger.

Another neat method is the use of the right foot. To attract attention, shove forward the right foot. A slight projection of the tip of the foot for a "dot"; a movement to the left for a "short dash", and to the right for a "long dash".

On this principle almost any member of the body can be put in practice to convey the three telegraphic symbols.

But the most remarkable feature of this system is the carrying on a communication at a distance; say a mile or so. This is effected by the arms alone. To ask attention, spread out both arms. For a "dot", close hands above the head; for a "short dash", extend the left arm; for a "long dash", extend the right arm. At the end of a word, drop both arms.

If convenient, a walking cane may be used for field practice. For night work, use two lamps. A circular swing to draw attention. Proximate the two lamps to make a single light for a "dot". Hold one lamp in front as a guide, for a swing to the left for a "short dash"; to the right, a "long dash", etc.

What can be more simple, and, under many circumstances, more useful, not only to the mute, but to the soldier on the battlefield, to the surveyor, to the telegraphist in distress, in giving the last parting message to a friend from a steamer or railroad train? It is obvious this need not be limited to the benefit of the mute, but could be recommended as a useful and interesting practice to all.

OBITUARY.

The Electrical Review regrets to learn of the death of Col. L. C. Baker, superintendent of the Western Union Telegraph Company, St. Louis, Mo., who died, March 25, of pneumonia. Colonel Baker was one of the pioneer telegraph men of the country, and a very capable and highly esteemed official of the Western Union. The remains were interred at Little Rock, Ark., March 28.

John Smith, Stand Up!

If the gentleman who sent to the Electrical Review some "Kind Words", under date of New York, March 31, 1897, signed "John Smith", will send us his real name and address, as a guarantee of good faith and not for publication, we will be pleased to publish his communication in full. The Electrical Review will not print anonymous communications.

Sight and the Incandescent Light.

[*From the London Lancet.*]

Some interesting discussion has taken place of late in regard to the effect upon the eye of the Auer incandescent light. The mantle of this incandescent system of lighting consists, as is now pretty generally known, of a network of the rare oxides (chiefly of thorium with a small proportion of cerium), which on being heated in the Bunsen flame emit a brilliant white light. As might be expected, this light is comparatively rich in the ultra-violet or chemically active rays that are identical with those in sunlight, and it has been urged that this richness in actinic rays may possibly be productive of injury to the sight. This argument appears to be based on measurements of wave lengths made by means of the spectroscope. The arc electric light, it is said, has similar effects, but of a more pronounced character. As yet there is no evidence of experience, as far as we know—and the Welsbach light has now been in use for several years—that the slightest injury to the optic mechanism where the system has been in use for domestic lighting has ever been produced; and unless a person deliberately stared at the naked light for some hours every day it would be surprising to learn that real injury could be referred to this cause. It is well known that the radiation of light downward from the incandescent mantle is feeble, so that without a reflector or some reflecting surface at the top of the mantle, as in the ordinary way would be provided by a ceiling, much of the illuminating power would be lost. From the particular point of view under discussion this is, however, an advantage for the lighting of rooms, since reflected and not directly transmitted light is pleasanter and more agreeable to the eye, besides which in the phenomenon of reflection partial absorption takes place, so that the light becomes pleasantly diffused and of a healthy tone. In any case, if any apprehension should exist that the rays proceeding from an incandescing mantle are injurious because of their chemical activity—an activity which in sunlight gives life to the plant world—these rays could be readily and effectually filtered out by the simple expedient of surrounding the light with a tinted globe, such as red or orange, which need reduce but very little the originally high illuminating power. Even then the light is over 100 per cent higher in illuminating value than the ordinary gas flame. Artificial light, of course, is most in request in the dark days of Winter, and in that season, at the best of times, we receive but little more than eight hours' light from the sun, and then frequently it is largely filtered from its chemically active rays by the medium of a murky atmosphere. On the other hand, we enjoy in the Summer just twice as much sunlight, which is then of greatly increased power, and the chemical activity of which is infinitely greater than could possibly be furnished by any known form of artificial light. Taking these simple facts into consideration, we should almost expect to find in some form or other some manifestation of deterioration in the eyesight during the Summer period, due to a largely increased exposure to the chemically active rays of solar light. We are not aware that any such manifestation has been observed. The argument that nature intended us to rest from the effects of light as soon as the sun is below the horizon demands, if it can be reasonably applied at all, the rejection of all artificial means of lighting, since there can be no light of any kind of any aid to the eye whatever, that can be without some chemical activity. Still less practicable does such a suggestion become when applied to the lands of the midnight sun and other places, or to the arctic Winter of several months' darkness. Clearly this theory could only be prompted by the consideration of the limited conditions of environment in the temperate zone. No men probably are exposed more freely and continuously to the chemically active rays of the sun than our sailors, yet their acuteness of vision and penetrative power of sight is a matter of admiration and wonder to every one. Sunlight is by a thousand circumstances widely and uniformly diffused, making it more acceptable to the eye, and during its journey to earth it undergoes an important modification, for in passing through the air it is deprived of some of the red rays, while the blue rays pass on—a circumstance which explains the azure character of the sky. In view of these facts, it is difficult to receive the theory with any seriousness that, because there may be a certain proportion of ultra-violet rays in a given artificial light it is necessarily injurious. It would be a sorry thing if these same rays were forever filtered out of the light of the sun by the medium of constant fog or cloud, as so often happens in the days of Winter. Exposure to a purely elementary light, as red, yellow or blue, does, undoubtedly, prove injurious either positively or negatively. The distress produced on working for some time, to quote one instance, in a red or yellow light, as in the darkroom of the photographer, who employs one or other of these colors on account of their chemical inertness, is well known. Absence of sunlight is held to be synonymous with the absence of life, and the life-giving and invigorating qualities of solar light are largely, if not entirely, dependent upon the chemically active rays, and certain lines of scientific research have shown that without the phenomenon of insulation going on day by day life would be unendurable and finally extinguished. White light, therefore, as afforded in its entirety by the sun, is a necessity of existence.

At the annual meeting of the Catskill, N. Y., Illuminating and Power Company, the old officers were re-elected: W. S. C. Wiley, president; A. M. Young, of Waterbury, Ct., vice-president; E. Lampman, treasurer; A. O. Shepardson, of Waterbury, Ct., secretary.

Little Bobby, His Papa and The Trolley Car.

[*From the New York Herald.*]

It was little Bobby's first ride on a trolley car, and he promptly opened up:

"Papa, what makes this car go?"

"Electricity, Bobby," answered papa from behind his paper.

"What is 'lectricity?"

"Er—it's a power they get from batteries and dynamos and such things."

Bobby was silent a moment, and kept looking out of the window. Just then another car came by, and Bobby commenced again.

"Is that funny thing on the top of the car a dynamo, papa?" he asked.

"No, Bobby, that's a pole."

"Do they push it with that pole?"

"No."

"Pull it?"

"No."

"What is it for, then?"

"Don't ask so many questions. That is where the electricity is carried from the wire to the car."

"Is it heavy to carry?"

"No."

The other passengers were on a broad grin, and papa was in a fidget. Just then another car passed, and some sparks flashed from the wire.

"Oh, papa, is that pole burning?" asked Bobby, with renewed interest.

Papa, thinking to make the best of it, sighed and said: "No, my son, that is caused by the closing and breaking of the circuit."

"Does it often break?"

"Yes."

"Who fixes it?"

"Bobby, will you stop asking questions?"

"The frantic effort of the motorman to stop the car at a down grade crossing next attracted Master Bobby's attention.

"Papa, what's that coffee mill for?"

"That's not a coffee mill; it is the handle to turn off and on the electricity. The man turns it to start and stop the car."

"Does he wind the car up?"

"No. For heaven's sake, Bobby, will you be quiet?"

Just then the car stopped suddenly, and the conductor went back hurriedly to the rear platform. This was too much for Bobby.

"Papa, the car stopped that time, and the man did not turn the grinder?"

"The car has slipped its trolley."

"Then we won't get home, will we?"

"Certainly; why not?"

"Because the other night, when you didn't get home, Uncle Jack told mamma he had seen you, and you looked as if you had slipped your trolley."

"We get off here!" said Bobby's father, quickly, and as the car started on its way again, even the hum of the motor did not drown the shrill shrieks of Bobby. And every individual woman in the car glanced back and murmured, "The brute!"

GENERAL NOTES.

At the annual meeting of the stockholders of the Oshkosh, Wis., Electric Light and Power Company the following officers and directors were elected: President and treasurer, C. C. Paige; vice-president, H. B. Harshaw; secretary, W. H. Huntington. Directors: C. C. Paige, H. B. Harshaw, A. E. Thompson, William Decker and Geo. Hilton.

On application of Albert B. Boardman, receiver of the Richmond Light, Heat and Power Company, of Staten Island, for instructions of the court, Judge Stover, of Brooklyn, has authorized a cash payment of $10,000 in settlement of detached coupons of the company amounting to over $23,000, relieving Erastus Wiman of liabilities to that extent, he having guaranteed them.

The East Penn, Pa., Traction Company, which contemplates building a trolley line through Yardley, Newtown, Doylestown and Trenton, has increased its capital stock to $1,000,000. The officers are: President, A. S. Cadwallader, of Yardley; vice-president, T. Howard Atkinson, of Buckingham, Pa.; treasurer, John C. McNaughton, of Philadelphia, Pa. The directors include Senator W. H. Andrews, of Titusville; C. S. Vandegrift, of Bucks County; Senator I. W. Durham, of Philadelphia; S. R. Nichols, of Crawford County; Lewis A. Conwell, Charles E. Hallowell and Dr. J. S. Wilson, of Jarrettown.

The 1897 edition of the hand-book, "Standard Wiring for Electric Light and Power," by H. C. Cushing, Jr., electrical inspector for the Fire Underwriters' Tariff Association, of New York, is now ready for delivery. This is the fifth edition of 5,000 copies, and will doubtless be eagerly sought for by central station managers and construction men. Mr. Cushing has added several new and valuable tables to the already large collection, and this edition, like the previous editions, is handsomely bound in flexible leather, and of convenient size for the pocket. This work is an authority on electric light and power wiring from the fire underwriters' standpoint, and is kept strictly up-to-date.

The directors of the Edison Electric Illuminating Company of Boston offer to stockholders of record March 25, 1897, 3,240 shares of stock at $120 per share at the rate of one new share for every 10 old shares now held by them. The right to subscribe will expire at close of business April 26. Payment for the shares must be made on or before May 3, on which date the certificates will be issued. No interest will be allowed on sums paid in advance. A "right" attaches to each share of old stock to subscribe for one-tenth of a share of new stock, but subscriptions for full shares only will be accepted. Subscriptions under holdings that are not multiples of 10 can be adjusted by purchase or sale of right. The company will neither buy nor sell rights.

CABLE TESTING.

READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION, MARCH 19, 1897, BY MR. GEO. D. HALE.

As the unreliable and, to a large measure, experimental methods in electrical construction of the past are being rapidly replaced by more substantial scientific systems, so is the pole-line giving way to the electrical cable wherever the change is feasible from a financial standpoint.

The demand for ever increasing reliability and high quality of service has long since settled this problem electrically, but financially, it often remains an open question.

As in everything else, there are all kinds and grades of cables, adapted to all classed of service, and complying with widely differing specifications. The feeble telephone currents and the high-potential circuits, alike require a high-resistance insulation, though for different reasons, and a most reliable construction of the line to secure the best results. For low-potential systems it is considered unnecessary to have such high resistance insulation, as the loss would be immeterial, and the element of danger would not be of any serious importance.

Assuming that high-grade cables are necessary, for telephone systems at least, the questions arise: First, how to manufacture such as will be suitable; second, how to test the same during and immediately following the process of manufacture; third, how to prevent their deterioration when laid, and fourth, how to locate trouble in them when it arises.

As regards the first, the manufacturers have solved this for us and have placed on the market the well known lead sheathed, paper insulated, dry core cable. For the benefit of some, a slight description of this cable might be in order. It consists of a bundle of separately insulated copper wires, varying in number from five to two hundred pairs, the usual size of wire being No. 19. As ordinarily constructed, each wire is taped with a paper ribbon, the wires of a pair being wound spirally around each other, each concentric layer being wound on spirally right and left hand alternately, the whole being wrapped with cotton yarn and inclosed in the lead pipe.

By far the larger proportion of these cables are without any paraffine or other insulating compound, but are simply baked until free from moisture. The main advantages of this type of cable are their low electrostatic capacity and their high-resistance insulation.

Their weak point is that a small opening in the lead sheath practically ruins a cable in a few hours.

Where a low capacity is not essential, the cables are usually saturated with paraffine, so that in case of a hole being made in the sheath, the entire section of the cable will not be rendered worthless. However, as paraffine absorbs moisture to some extent, the opening should be located and repaired as early as possible, to prevent the loss of a considerable length of the cable.

Now, considering the second question as to factory tests, this will be divided into the two heads: Tests made during the process of manufacture, and tests made immediately following the completion of the cable.

In the former, the wires are simply tried with battery and bell to test for continuity and obsence of crosses. In the case of a broken wire, as in Fig. 1, the capacity of each portion is measured as against the rest of the wires, and by direct proportion, the distance from either end is determined.

Capacity of $a\ b + b\ c$ should equal capacity of good wire $d\ e$.

Capacity of $a\ b + b\ c$: capacity of $a\ b$ :: length of $a\ c$: length of $a\ b$.

If the insulation is low, a special method, to be described later, must be used.

When two wires are crossed the resistance of the wires are measured separately, also the resistances around the loops $a\ e\ c$ and $b\ e\ d$ are determined, corrections being made for the resistance of the cross, and the distance from either end calculated as in Fig. 2.

Resistance of wire per foot, as measured in $a\ b$ and $c\ d$ is found to be say X ohm. Then the resistance of the loop $a\ e\ c \div \times =$ twice the length from a *to* e. To check the work, the resistance of loop $b\ e\ d$ may be measured.

The cables, having passed through the preliminary tests, go next to the drying ovens and then to the hydraulic lead presses, where their manufacture is completed. After cooling sufficiently they are turned over to the cable testers, where the electrostatic capacity and insulation resistance of the wires are measured. The requirements usually specified demand an average capacity not exceeding .080 with no wires above .085 microfarad per mile. The insulation resistance must be at least 500 megohms per mile. In saturated cables the capacity varies between .1 and .3, depending upon the details of construction, and the insulation resistance ranges between 100 and 1,000 megohms per mile. The absolute capacity and insulation resistance of the wires vary from one-thousandth of a microfarad up, and from 500,000 megohms down, depending on the length and kind of cable, so very sensitive instruments must be used.

A large four-coil astatic needle Thompson galvanometer has been found to be suitable, and having a potential of 600 volts at command, the insulation resistance constant is 528,000, while 2,000,000 can be obtained, if desired. For capacity measurements the constant is 26,400, which is sufficiently high for all cables usually met with, however short.

The 600 volts are generated by a motor-dynamo obtaining current from a storage battery of 20 volts. A very steady voltage is thereby secured, so that the potential can be used in the testing circuits in the same manner as if the voltage was derived from a battery direct. The following are the circuits used: For capacity and resistance in the cable tests, Fig. 3; for capacity only, Fig. 4.

In charging dry-core cables with the 600 volts, it seems to make no difference in capacity readings how long they are in circuit, but the insulation resistance increases slightly with the time of charging. However, in saturated cables, the longer the cables are charged the greater are the capacity and the insulation resistance, owing to the soaking in of the electricity and the polarization of the dielectric. Five seconds are sufficient for dry cables, while one minute is uniformly used in all saturated ones.

It is sometimes stated that the insulation resistance of a cable will not be the same when measured with different potentials, but it has been found that such is not the case. As long as the dielectric acts as a conductor only, there being no sparking through the paper, no change in the insulation resistance could be detected.

Heat increases the capacity and decreases the resistance to a slight extent in dry cables, but in saturated ones the variation is most pronounced.

The curve, Fig. 5, was plotted from experiments which illustrates this point.

This curve was constructed from tests made on a paper insulated, lead sheathed, electric light cable having a No. 6 solid conductor surrounded by one-quarter inch thickness of paper saturated with resin oil. It was placed in a large tank of water, heated very gradually, and was allowed to remain two or three hours at one temperature before a reading was taken, in order that the error should be as small as possible. The factory tests on all saturated cables made in the Winter are, therefore, as a rule, somewhat higher in resistance and lower in capacity than those tested in Summer. This is due largely to the reason just mentioned, but the presence of moisture in the air during the Summer also tends to lower the resistance to some extent, as the cable ends absorb some moisture from the air. Since a cable is nothing more nor less than a condenser of a small capacity, so anything which affects one may be expected to have its effect in the other; hence, when the resistance of insulation drops for any reason, the capacity increases, as to compress the cable, which brings the wires closer together, this result is noticed.

In a 100-pair No. 19 wire dry paper cable an increase of one thirty-second of an inch in diameter will decrease the capacity about three-thousandths of a microfarad per mile. This increase does not apply to the pipe alone, but the whole cable is loosened to some extent. Another detail which increases the capacity of this style of cable is the paraffine which saturates the ends of the reel length. This is done to prevent the absorption of moisture by the paper, which is exceedingly dry, while the cable is being tested, as well as when the splices are being made between reel lengths.

How to prevent the deterioration of the cables after being laid is the next question. The ease with which the lead-sheathed cables may become punctured is their admitted weak point, and how to protect them from electrolysis and mechanical injury is difficult as well as expensive. Electrolysis is often prevented by coating the lead sheath with several layers of tape laid on with some insulating compound. This process has given good satisfaction in some places where the conduits are filled with water, having a corrosive action on the lead. Mechanical injury is usually avoided by placing the cable in strong conduits or in elevating them on poles.

As regards the test of cables when laid, much which has been said concerning factory tests applies equally well here. However, the main differences lie in the decreased sensibility of the apparatus required, and the new feature of hunting and locating trouble. The long lengths of cable mains have a high absolute capacity and a low insulation resistance, so the instruments need not be nearly so sensitive as in the usual factory tests. The greater part of the trouble in telephone mains can be traced to low insulation, usually located in splices, or near perforations in the sheath. The old orthodox method of cut and try is often used; this consists in opening the line successively from splice to splice and locating the trouble in a certain length. However, this is only used when the insulation resistance is comparatively high, or when all the wires in the cable have the same resistance, which two conditions prevent the usual loop tests. In Fig. 6 is shown Varley's loop test, which is employed to locate the place where a wire is grounded to a greater or less extent against the sheath.

Since the resistance of the ground introduces no error in the work, but simply makes the galvanometer less sensitive, this method may be very accurate, when proper precautions are taken.

In an aerial cable line, about seven miles long, the location of a partial ground was found by this method where the resistance of the ground was over 300,000 ohms, while the best wire was only three megohms. When the contact of the grounded wire is variable, great care is necessary to avoid misleading results. When two wires are crossed with a high resistance at the point of contact, Varley's loop method may be used, considering one of the wires as the ground and using an extra wire for the clear side of the loop. Thus it may be seen that, with proper instruments and a little care, the location of any trouble usually met with is comparatively a simple matter.

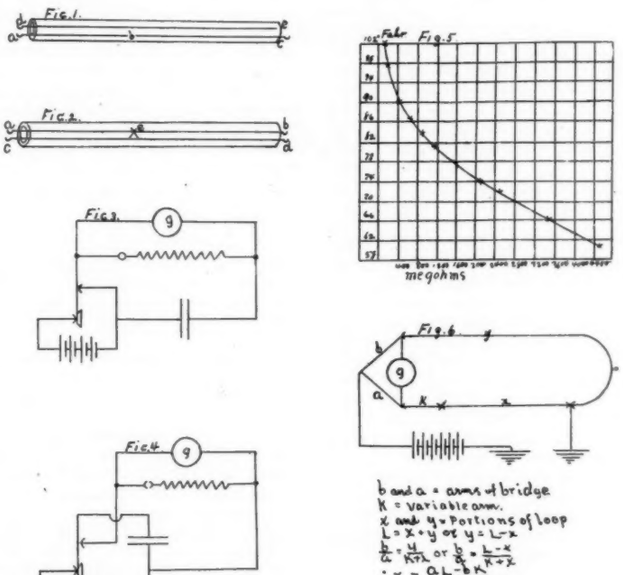
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4
Fig. 5
megohms
Fig. 6.
b and a = arms of bridge
K = variable ohms.
x and y = Portions of loop
L = x + y or y = L − x
$\frac{b}{a} = \frac{y}{K+x}$ or $\frac{b}{a} = \frac{L-x}{K+x}$
$\therefore x = \frac{aL - bK}{a+b}$

DIAGRAMS ILLUSTRATING MR. GEO. D. HALE'S PAPER ON "CABLE TESTING."

THE INFLUENCE OF HEAT TREATMENT UPON THE MAGNETIC PROPERTIES OF HARDENED STEEL.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 24, 1897, BY DR. K. E. GUTHE.

(*Concluded from page 155.*)

G. Rings reheated to 200 degrees—Apparatus for the heat treatment: On the top of the heating table were placed two strips of asbestos, on this a disk of the same material with a round hole in the middle, then a layer of iron turnings, and on this the ring. The whole was surrounded with an asbestos ring, which was filled with iron turnings, so that the ring was entirely imbedded in the same. The temperature was read by means of a thermometer, which was placed so as to touch the ring inside. By the arrangement described, uniform distribution of heat from the center was procured. As soon as the temperature rose to 200 degrees the ring was withdrawn and allowed to cool in the air.

I give the results for ring I only, the others showing a very small increase in magnetic induction.

We will see from the comparison, with the data given later on, that the increase of induction is comparatively small in all rings.

H. Rings reheated to 300 degrees—The heat treatment was practically the same as in G.

All rings show a decided increase in permeability, the change being the smaller the less carbon the steel contains. The curve for ring III, indeed, coincides so nearly with that of the hardened ring that the points corresponding to this step could be indicated only by dots in the plates. The wrought-iron ring that so far showed no sign of a change has a larger permeability for small fields than it had before. By comparing the curves on Plate 4, we see a decided tendency towards an increase of the remanence for any given value of maximum induction. This will become more and more decided as we increase the temperature to which the rings were reheated.

The most important and rather unexpected result of this step is the sudden very large increase in the maximum induction of ring I. The number of lines of magnetic force has almost reached the value the ring had before it was heated at all. Therefore, whatever change in the chemical or physical constitution of the ring produces the change in the magnetic properties, it is largest for the high carbon ring between 200 degrees and 300 degrees, *i. e.*, at a temperature which corresponds to that of the blue temper of steel.

I. Heated to 450 degrees—Heat treatment was practically the same as in G.

We observe a further increase of permeability and induction for all rings. The change for ring I is only about one-third of the one in the preceding case, while we have a comparatively large change for rings II and III, corresponding to the large difference in B_m of ring I, observed before, and to be attributed to the same causes.

It is to be noticed that, though the magnetic flux has practically reached its maximum for the field strength used, the value of the coercive force is still quite large in comparison with the corresponding value for the rings in the original state. The remanence for ring I is larger after this step than in any other. The substance is Crescent steel, *i. e.*, magnet steel. It is apparent that, in order to make strong magnets, it will be advisable to reheat the quenched steel to about 450 degrees. The magnets could be made more than twice as strong as if simply the hardened steel is used. Though I worked with closed magnetic circuits, the influence of the ends of the magnets will be the same in the two cases. It is of importance that the coercive force did not decrease nearly as fast as the remanence increased. Another factor in the making of magnets is their permanency. I mentioned the usual method of making permanent magnets in the introduction, and think that a similar treatment, by extending the range of temperature to 450 degrees, will ensure permanency and produce stronger magnets.

K. Rings annealed—The rings were again placed in muffles and heated to a bright red heat, the arrangement being the same as in B and C. After the temperature of about 850 degrees was reached the fire was banked and the rings allowed to cool inside the muffles. Charcoal was put in the mouth of the muffles. This treatment took about 24 hours.

The rings have become magnetically soft. While in the rings II and III the saturation point was practically the same as before, the coercive force decreased to its smallest value, this last step being the largest in the whole series for the coercive force.

In the high-carbon steel and the wrought-iron we find a remarkable decrease in B_m, accompanied in ring I by a still greater decrease of B_r, while in the iron B_r increases with respect to B_m. These changes can very plainly be observed on Plate 5, where B_r is plotted as a function of B_m. The curve obtained for ring I differs entirely from any of the curves taken after the ring was hardened, but it shows a great similarity to curve A taken in the original state.

Hoping to obtain similar curves for the other two steel rings they were again annealed, the temperature this time being raised to nearly 1,000 degrees. Cooling took place in the same way as before.

L. Reannealed—Both rings show the decided decrease of B_r and the different character of the curve. The one for ring III is indicated by dots only, and coincides partly with curve C. In both cases there is a great similarity with the curves B, obtained by heating the originally annealed steel to a high temperature below the point of recalescence and suddenly quenching. It almost seems that the steel by this process has become a different substance. These curves show more the characteristics of the iron (see ring IV on Plate 5) than of steel. Houston and Kennelly's law does not hold for nearly as wide a range as before. I believe that the effect observed in the last step is not an immediate effect of annealing, but that it is the conditions under which cooling takes place, that influence largely the retentivity of steel.

Steel heated to a high temperature below the point of recalescence and suddenly quenched, will very easily lose its magnetism. This seems to me of practical importance. The maximum and induction being the same, the remanence a great deal smaller than in the ordinary state, it is apparent that the hysteresis loss will be much smaller, and, therefore, very mild steel, as our ring III, treated in the way indicated above, is preferable to the ordinary mild steel used in transformers or other instruments, in which cyclic processes take place.

Since the hysteresis loss has been found to increase appreciably in transformers after they have been used for some time, it is of great importance to investigate whether a similar effect takes place in steel treated in the manner suggested. A series of such experiments seems to me very valuable from a practical point of view.

In 1890, Osmond (*Phil. Mag.* 29,-511, 1890) advanced a theory according to which a bar of steel consists of an intimate mixture of α iron (magnetic) and β iron (unmagnetic). He considers the β modification as forming in a steel a porous framework, the ratio between the amount of α iron and β iron not changing under the influence of currents and of magnets. "In the presence of the rigid network of β iron, the polarized α particles are conceived as catching in the pores of the β structure and immovable in this position, thus resulting in a permanent magnet." Moreover, he supposes the temporary induction and the remanence to be a function of the ratio $\frac{m}{n}$ where m is the percentage of α iron, and n the percentage of β iron in the steel. Let mp and np (Fig. 1) represent the corresponding values, then the maximum induction is proportional to mp, the residual to mr. Further supposing, that the fraction of the maximum induction forming the remanence (r) is proportional to the amount of β iron (n), he derives the formula

$$r = K\left(m - \frac{m^2}{100}\right) = K\left(x - \frac{x^2}{100}\right)$$

Then the remanence is represented by a parabola starting from O upward and meeting the X axis at a point corresponding to 100 per cent α iron.

Suppose this theory to be correct, then by a change of β iron to α iron the difference between the maximum induction and the remanence increases. My experiments show that this does not take place by reheating the hardened steel. (Compare results represented on Plates 4 and 5.) On the contrary, the difference becomes smaller. We can not assume a transformation of α iron to β iron, since the permeability increases decidedly, on reheating. On the other hand, the sudden drop of the remanence observed before the point of recalescence is reached would correspond very well to Osmond's theory, if we suppose a transformation of β to α iron has taken place.

I believe that we have also to take the influence of the carbon compounds into account, which has not been done by Osmond. Let us assume that the reheating has such an influence on the iron and the carbon compounds as to decrease the area between the maximum induction and the remanence, and that the rate of this change decreases, the higher the temperature to which the rings are reheated. My theory is supported by the curves showing the change in iron on Plate 4. This change, whatever it may consist in, first masks the other, if it is present at all. Then, after the former is completed, a further heating will show the characteristic influence of the transformation of the β to α iron, showing itself in the decided lowering of the remanence.

The results of this research may be summarized as follows:

1. The point at which steel becomes magnetically hardened by quenching lies at different temperatures, according to the amount of carbon contained. It is considerably lower in high-carbon steel than in low-carbon steel, and corresponds closely to the different temperatures at which occurs recalescence of steel.

2. The higher above the point of recalescence steel is heated before being quenched, the harder it is magnetically.

3. The magnetic hardening produced by quenching is the larger, the higher the percentage of carbon.

4. Reheating has in general a softening effect upon the magnetic properties of hardened steel, *i. e.*, permeability increases, and is accompanied by an increase of maximum induction and a decrease of the coercive force. But a hardening is noticeable in the low-carbon steel after it has been reheated for a short time to 100 degrees. The greatest change in the maximum induction takes place for high-carbon steel between 200 degrees and 300 degrees, for low-carbon steel between 300 degrees and 450 degrees, beyond which temperature there is hardly any change in the practical limit of saturation. All change taking place in reheating beyond 450 degrees consists in an increase of permeability for small magnetizing forces, *i. e.*, a decrease in the coercive force or hysteresis loss.

5. To produce strong magnets, the hardened steel should first be reheated to 450 degrees.

6. Heating to a high temperature below the point of recalescence and sudden quenching produces a steel with a very weak retentivity; in consequence of which the hysteresis loss in a cycle is greatly decreased. This result may also be obtained, though in a lesser degree, by annealing at a very high temperature.

I am greatly indebted to Mr. L. F. Morehouse, one of my students, for the valuable assistance rendered me in most of the experiments.

Physical Laboratory of the University of Michigan, March 13.

Electrical Equipment of the Illinois Central.

[*From the Railroad Gazette.*]

Within the last week there has been a great revival of the statements that the Illinois Central is to equip its lines for suburban working with electricity. All of our readers know that this statement has been made, at frequent intervals, for the last five years. They also know that Mr. Wallace has been recently engaged in a very careful and thorough study of the subject, and none of us would be much surprised, any time, to know that bids were to be asked for.

We can say, however, on the best authority, that no bids have been asked for yet for the electrical equipment of the Illinois Central's suburban lines between Randolph and Sixty-third streets, inclusive, in Chicago, and we can say, further, that such bids are not likely to be asked for at present. It is true that the board of directors have come to the conclusion that it will be expedient to work that part of their system by electricity. They have authorized the president to pursue his inquiries into this matter with a view to opening negotiations for the necessary plant. It is still too early, however, to say when the electrical service will be put into use, and for the present the decision of the United States Supreme Court in the Trans-Missouri case makes it very doubtful, indeed, whether it will be at all worth while for railroad companies to invest additional money in their business. That consideration alone is enough to postpone, for the present, definite action on this costly project.

The "Ideal" Automatic Interrupter for Induction Coils.

Messrs. Willyoung & Company, of Philadelphia, have recently brought out an improved interrupter for induction-coil work, which they claim to be much superior, in every respect, to any other form of automatic break hitherto used, not excepting even the Foucault and other forms of the mercury break.

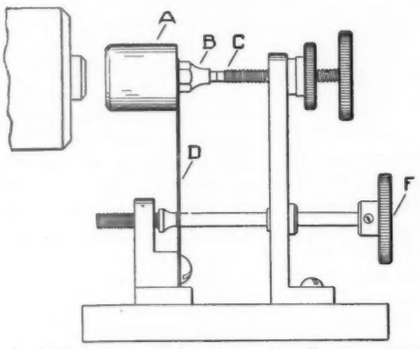

FIG. 1.—DETAILS OF THE APP AUTOMATIC INTERRUPTER.

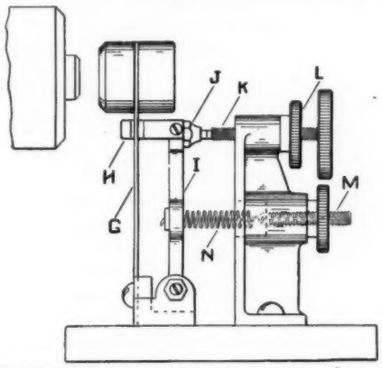

FIG. 2.—DETAILS OF THE "IDEAL" AUTOMATIC INTERRUPTER.

That the scheme of this new interrupter is unique is readily seen by inspection of Fig. 2, which shows the interrupter in diagram. Fig. 1 shows, also in diagram, the scheme of the ordinary or App vibrator in common use. In the latter the hammer-head A is attracted by the iron core, thus breaking the contacts B and C. The head A immediately flies back by virtue of the resiliency of the spring D, thus again closing the contacts B and C and allowing the process to be repeated. The tension of the spring may be varied by means of the lower adjusting screw F, which, however, it will be observed, applies the force in a manner mechanically undesirable. The chief defect in this type of vibrator is the defective principle involved. tion of forced vibration, which entails consequent irregular breaking and corresponding irregular discharge in the secondary.

Turning to Fig. 2, the plan of interrupter is seen to be entirely different from that just described. The spring G is supported at its lower extremity, just as with the App vibrator, but is otherwise entirely free. Surrounding the spring, near the hammer-head, is a yoke H rigidly attached to a stiff casting I, which is itself pivoted below. This casting carries the front contact point J. The back contact point K is controlled by a pair of set-screws L, while a lower adjusting screw M controls the tension of a helical spring N, itself attached to the casting I. The spring G is very stiff, and, when vertical, stands entirely free of the yoke N. In action the hammer-head is attracted by the core, but, quite otherwise than in the App interrupter, is able to move a considerable distance and attain a very high velocity of motion before striking the yoke and thus breaking the circuit. The magnetic pull on the hammer-head being thus released, the hammer-head flies back, partly by virtue of its own spring G and partly on account of the pull of the spring N. The contact points coming together close the circuit once more, and the core's magnetism immediately begins again to act upon the hammer-head, the motion of which, however, it can instantly stop, and the head swings on, being gradually brought to rest and its motion reversed again, striking the yoke while moving at high speed.

That the suddenness of this break is vastly greater than with the App break is evidenced by several facts. In the first place, the arcing is practically nil, and when coils—say eight to 12-inch even—are run with it upon a proper electro-motive force, it is said to be actually necessary often to look closely at the vibrator in order to see any sparking whatever. Furthermore, after continuous runs for 30 or 45 minutes, or even more, there is no appreciable rise of temperature even at the contact points, while with the App break the entire mass of the vibrator would have become too hot for the touch. A further evidence (which is of decided importance) is that the same coil, operated by the new vibrator, as compared with the App, is claimed to require not over one-half the current to produce results equally as good, if not better.

Thus with Willyoung coils and "Ideal" interrupters are required:

1-cell	storage	battery	to	run	4″ coil
2 "	"	"	"	6″	"
2 "	"	"	"	8″	"
3 "	"	"	"	12″	"

Another feature of this new vibrator is that it is capable of direct use upon a commercial circuit of 110 volts, requiring only a rheostat in series, with primary, to hold the current down to a suitable value. The sparking on such a circuit is perhaps a trifle greater than with battery, though not so great as with the majority of the vibrators now used with various coils when run by battery.

It is clear that, with this form of vibrator, we also get rather longer makes than with the App vibrator. To change the speed of the vibrator, we have only to screw a vertical rod into the hammer-head, and upon it place an adjustable bob.

Workers with induction coils have probably noticed the irregular secondary discharge often produced when the vibrator castings were weak or insecurely fastened to the base. This is due to the parts getting into a condition of forced and independent vibrations, partly due to the shocks sustained by the contact points, and partly to the vibrations produced in the coil and reinforced by the resonance or its base. In the "Ideal" vibrator this has been successfully overcome by making the castings very stiff and mounting the parts upon a hard rubber base, which base is carefully surrounded by heavy felt and then by a brass box, which clamps the whole firmly to the base. In this way the vibrator is not mechanically connected to the rest of the apparatus, and any vibrations transmitted to it are instantly damped out by the felt.

The "Ideal" interrupter is not only now furnished on all Willyoung coils, but is also furnished separately for use with coils of other makes. To use it only requires a very simple change in connections, for the making of which directions are sent with the interrupter, and the owner himself may make the change in a very few moments. Fig. 3 shows the "Ideal" interrupter ready for use, with any coil, and Fig. 4 the same, but combined with the Willyoung adjustable condenser. As the condenser in the average coil is not very carefully adjusted, the makers always advise the use of the combined condenser and interrupter (as in Fig. 4) rather than the interrupter only, as in Fig. 3.

The "Ideal" interrupter is protected to Messrs. Willyoung & Company by application for letters patent, and is for sale, as is all Willyoung apparatus, by Mr. James G. Biddle, 910 Drexel Building, Philadelphia.

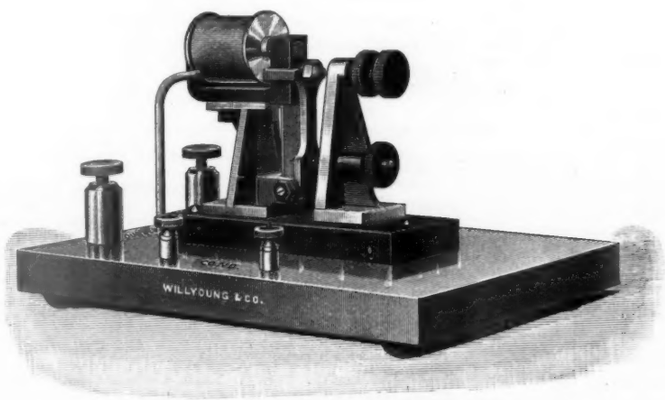

FIG. 3.—THE "IDEAL" AUTOMATIC INTERRUPTER.

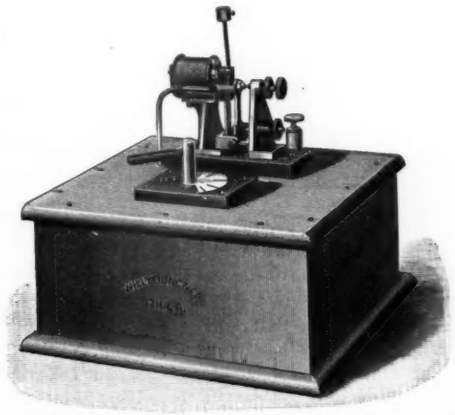

FIG. 4.—THE "IDEAL" INTERRUPTER AND WILLYOUNG CONDENSER.

The circuit is closed by the coming together of the points B and C; in breaking the circuit, we require, theoretically, great suddenness, but this is obviously unobtainable, since the hammer-head is at rest and requires a very appreciable time to attain any great velocity of movement, while the current is reduced nearly to its zero value by the first infinitesimal movement of the contact point, thus correspondingly reducing the magnetic pull. Furthermore, the violent blow given to the one contact point by the other throws the spring into a condi-

LITERARY.

The April number of the *North American Review* contains, among other noteworthy features, an article from the pen of the Marquis of Dufferin and Ava on "How India Fights the Famine".

The General Electric Railway Company, of Chicago, has filed a bond for $100,000 with the city clerk, and expects to have considerable track laid by September 15.

ADVANCE INFORMATION

Electric Light and Power.

MARTIN, MICH.—City Clerk may be addressed concerning erection of electric light plant.

NEW HAVEN, MICH.—Village Clerk may give information concerning construction of electric light plant, for which 10-year franchise has been granted.

SOUTH LYON, MICH.—A municipal electric light plant will be established.

BREWTON, ALA.—The Mayor may be addressed concerning erection of electric light plant.

BROOKHAVEN, MISS.—Address the Mayor concerning construction of water and electric light plants.

COCHRAN, GA.—Address clerk of Town Council concerning electric plant complete.

NEW YORK, N. Y.—Henry E. Howland, president board of managers Manhattan State Hospital, may be addressed concerning installation of new electric lighting mains for hospital.

ROCK RAPIDS, IOWA—J. K. Medberry, Recorder, may be addressed concerning installation of complete electric lighting plant.

WADSWORTH, OHIO—Electric lights are to be established here.

HANCOCK, N. Y.—Electric lights are to be established here. A stock company is being formed with $10,000 capital. The officers are: President, H. McGranighan; secretary, F. A. Taylor; treasurer, W. H. Nichols.

GEORGETOWN, COLO. — Arrangements have been made to put in an electric lighting plant here.

XENIA, OHIO—J. S. Jones, president board of trustees, O. S. and S. O. Home, may give information concerning furnishing, constructing and operating an electric light plant.

UNION, S. C.—F. M. Farr, chairman waterworks commission, may give information concerning construction of water and electric light works.

MCMINNVILLE, TENN.—Address the Mayor concerning construction of waterworks and electric light plant, for which the city has voted an issuance of $30,000 in bonds.

SEABRIGHT, N. J.—The Seabright Electric Light Company has been organized, with Dr. James J. Reed, president; E. S. Nesbitt, secretary; L. G. Irwin, treasurer. Capital stock, $10,000.

ST. AUGUSTINE, FLA. — W. A. MacWilliams, Walter French and Cromwell Gibbons have been granted franchise to erect an electric light plant.

SUFFIELD, CT.—The Suffield Electric Light Company has given contract for erecting an electric light plant to Mr. Swan, of Boston.

New Electric Railways.

HAMBURG, N. Y.—The Buffalo, Hamburg & Aurora Railway Company has been incorporated by William W. Wheatley, of Brooklyn, and William J. Wright, of Buffalo, to construct a street surface electric road. Capital stock, $200,000.

BELMAR, N. J.—The Atlantic Coast Electric Railway Company has secured a franchise to construct and operate an electric line through certain streets of the borough.

CHICAGO, ILL. — The Chicago Western Electric Street Railroad Company has changed its name to the Chicago Western Elevated Electric Railway Company.

WINSTED, CT.—The capital stock of the new company, which is to operate an electric street railway between here and Torrington, has been subscribed. Torrington and Winsted capitalists are each to hold $26,000 worth of stock in the road, and $150,000 will be subscribed by outside parties. It is expected to have the line in operation by July 1. Work on the construction is to begin immediately.

CHARLESTON, W. VA.—There is a project on foot to establish an electric car line between this place and Shannondale Springs, and possibly to Harper's Ferry.

MILWAUKEE, WIS.—Steps are being taken to build an electric line from a point near Waukesha to this city.

JAMAICA, L. I.—The Long Island Electric Railroad Company have applied to the village trustees for the privilege to extend their trolley line along South street to Canal street, thence to Fulton street, and connect with the extension to Queens and Hempstead.

DAYTON, OHIO—An effort is being made to get the right of way on the Wolf Creek pike, to build and operate an electric road from this place to Greenville.

New Telephone and Telegraph Companies.

MARENGO, IND.—A telephone line is being constructed between this place and English, and will be in operation in about 10 days. This line is to be extended from English to Eckerty.

ALEXANDRIA, TENN.—The *Times* is agitating the question of establishing a telephone exchange at this place.

ALFRED, N. Y.—The Alfred Telephone and Telegraph Company has been incorporated to maintain a telephone line from this place, Allegany County, to Hornellsville; capital, $2,000. Directors, Colvin D. Reynolds, D. Sherman Burdick, William H. Crandall, Charles T. Harris, of Alfred, and others.

GOTHENBERG, NEB.—A telephone system is to be established here.

FRANKLIN FALLS, N. H.—A movement has been started to construct a telephone line connecting this city with Taunton Hill, Kilburn's Corner, East Andover, Andover Center and Potter Place.

AUBURN, NEB. — The telephone company at this place is talking of extending the system to all other towns of the county.

RED RIVER, N. MEX.—The Red River, Taos, Santa Fe Telegraph Company has been organized, with a capital stock of $50,000.

WOODSTOCK, VA.—The Shenandoah County Telephone Company has been incorporated, with Col. J. C. Baker, president; M. B. Wunder, vice-president; J. H. Grabill, secretary and treasurer. The company has purchased the line now running from New Market to Strasburg, in this county, and will place same in good working condition immediately.

ABILENE, KAS.—A telephone line is to be established here.

BRANSFORD, TENN. — The Bell Telephone Company will extend their lines from Bethpage, three miles below here, to Westmoreland, on the Chesapeake & Nashville Railroad, and from Westmoreland they will put in a branch wire connecting the celebrated Epperson Springs. Two additional metallic wires will be put in, running from Gallatin to Westmoreland. Long-distance telephones will be put in at this place and at Westmoreland. The company will, at an early date, extend their line to Scottsville, Ky., tapping Turner Station and Sugargrove, Tenn., and Alexander and Petroleum, Ky.

New Incorporations.

HANCOCK, N. Y.—The Hancock Electric Company has been incorporated to manufacture electric light and power in Hancock, Delaware County. Capital, $10,000; and directors, L. E. Howard, T. F. Furie, T. F. Stimpson, Willis S. May, of Hancock, and others.

NEW YORK, N. Y. — National Electro-Galvanizing Company has been incorporated. Capital, $240,000. Directors, Edmann N. Brandt, Will G. Hay and Edward A. Owen, all of New York; Horace H. Thayer, of Yonkers, and Theodore L. Pottoff, of Long Island City.

Increase of Capital.

NASHUA, N. H.—The H. N. Bates Company, of Boston and Nashua, makers of electric goods, have decided to enlarge their business at the factory here. The stockholders have voted to increase the capital stock from $125,000 to $150,000.

BELAIR, MD.—The directors of the Hartford County Telephone Company have increased its capital stock from $5,000 to $10,000.

Business Troubles.

NEW YORK, N. Y.—I. Sidney Bell has been appointed receiver for the Ball Electric Light Company by Justice Smyth, of the Supreme Court.

Corporation Counsel Newell, of Syracuse, N. Y., has forwarded to Albany a bill providing for the increase of the limit to the street lighting fund from $80,000 to $90,000. This is in accordance with a resolution adopted some time ago by the Common Council.

FOR SALE.

RAILWAY GENERATORS.

3 M. P. 500, 666 horse-power, 500-volt generators with station equipments.
4 D 62, 80 horse-power, 500-volt generators with station equipments.
4 M. P. 75, 100 horse-power, 500-volt generators with station equipments.
1 D 50, 55 horse-power, 220-volt generator with station equipment.

RAILWAY MOTORS.

10 W. P. 50, 25 horse-power motors.
15 F. 30, 15 horse-power motors.
20 G. E. 800 drum armatures, 4 turn. New.

STATIONARY MOTORS.

1	1½	horse-power,	110 volt,	Thomson-Houston.
1	1½	"	220 "	Robinson-Foster.
2	½	"	220 "	Edison.
1	3	"	220 "	Edison.
1	3	"	220 "	Thomson-Houston.
1	15	"	220 "	Belknap. New.
2	1	"	500 "	Ketchum. New.
1	5	"	500 "	Eddy.
1	5	"	500 "	C. & C.
1	¾	"	110 "	Thomson-Houston.
1	3	"	110 "	Thomson-Houston.
1	1¾	"	220 "	C. & C.
1	5	"	220 "	Am. Eng. Co. New.
1	50	"	220 "	Thomson-Houston.
1	10	"	500 "	Edison.

And many other motors not mentioned above. All motors have sliding base frames and fireproof rheostats.

ELECTRIC PUMP.

A 10-horse-power, 500-volt Thomson-Houston motor, direct connected to Gould pump, capacity, 10,000 gallons per hour.

TRANSFORMERS.

A large lot of Stanley transformers, from 15-light to 100-light, 1,000-volt primary; part 50-volt secondary, and part 100 volt secondary.

125-VOLT INCANDESCENT DYNAMOS.

4	6	Kilowatt,	110-light,	Edison.
5	12	"	210 "	"
1	15	"	270 "	"
2	20	"	360 "	"
1	30	"	540 "	"
1	7½	"	135 "	T.-H.
1	3	"	55 "	"
1	8	"	135 "	" "C. I."
1	16	"	275 "	" "E. I." type.
1	25	"	450 "	Edison.
3	30	"	540 "	T.-H. "H. I." "
1	1,000-light M. P., Westinghouse.			

ALTERNATING DYNAMOS.

1	A 35,	650-light,	Thomson-Houston.
1	A 70,	1,300 "	"
2	650-light,	Westinghouse.	
2	750	"	"
1	1,500	"	"
3	1,000	"	"

The above are all 1,000-volt machines, and are complete with exciters and station equipment.

ARC DYNAMOS.

1	5-light,	2,000 candle-power,	Brush.	
1	5 "	1,200 "	"	
1	20 "	2,000 "	"	
4	30 "	2,000 "	"	
1	45 "	1,200 "	"	New.
1	65 "	2,000 "	"	
2	50 "	2,000 "	Thomson-Houston.	
4	45 "	1,200 "	"	
1	30 "	2,000 "	"	
2	30 "	1,200 "	"	
1	75 "	1,200 "	"	

ARC LAMPS.

15 K. 12, 1,200 candle-power, single, Thomson-Houston.
10 1,200 candle-power, single. Brush.
27 No. 17, 1,200 candle-power, double Brush.

EVERY MACHINE TESTED AND GUARANTEED.

FRANK RIDLON COMPANY,

180 SUMMER ST., BOSTON, MASS.

New York Agent, CHARLES N. WOOD, 80 Broadway, Room 131.

Kindred.... ...Interests

The New York offices of the Keystone Electrical Instrument Company, Philadelphia, have been removed from 36 Dey street to the Smith Building, 15 Cortlandt street, where more commodious quarters have been secured. Mr. Elmer P. Morris represents this company, as heretofore.

Insulation—Under this heading the Standard Paint Company, 81 and 83 John street, New York city, issues an attractive leaflet calling attention to the well known and popular P. and B. products. These include the "compound", armature and field coil varnish, insulating tape, insulating paper and preservative paint.

The Central Electric Company, Chicago, has taken the agency for the new 1897 Emerson induction desk fan motor. It is made in two sizes, 12 and 16 inches, and suitable for any frequency. It will be kept in stock, wound for the usual voltages, so that orders can be filled with the company's proverbial promptness.

The E. S. Greeley & Company's Receivers' Sale—Receivers Edw. S. Greeley and James W. Sands, of this company, announce that all the goods of E. S. Greeley & Company must be sold by April 15, and only bids for goods in quantities can now be considered. This is an opportunity for securing electrical and railway supplies at a very low figure.

Since the receivers of the B. & O. decided to paint all the equipment Royal Blue, 179 passenger, baggage, express, postal and dining cars have been sent to the shops and have been turned out adorned with the new and distinctive color. The car shops are repainting, on an average, two cars per day, and it is hoped by Fall the entire passenger equipment will have been thoroughly overhauled and repainted.

The Electric Launch Company, Morris Heights, New York city, has issued a beautifully prepared leaflet describing its new type of electric launch for public parks, pleasure resorts and Summer hotels. In this new type of boat the side seats have been discarded, the floor is of polished wood, covered with rugs and wicker easy chairs and cozy divans are used to seat the passengers. The batteries are all located in the hull of the launch below the floor.

The Northern Electrical Manufacturing Company, Madison, Wis., has opened a Chicago office at 1602 Monadnock Block, in order to be better able to take care of the increasing business of that vicinity. Mr. Arthur W. Paine has been appointed agent at Chicago, and his wide experience in the electrical field, coupled with more than an ordinary amount of energy and ability, will make it an easy matter for him to get a generous share of the motor business. The Northern Electrical Manufacturing Company has recently made some important additions to its factory equipment, and is now prepared to undertake the installation of dynamo and motor plants of any magnitude.

The Hand-book of the Standard Underground Cable Company is now ready for distribution. The present edition, No. XV, contains 182 pages, and is an amplification of the No. XI Hand-book, published in 1890, with necessary additions to bring contents up to date in every respect. The purpose kept in mind in preparing this revised edition has been to give all useful information relating to electric wires and cables, and the installation of the latter, in as brief a form as possible, and also to provide convenient rules, tables, etc., for ready reference, and for use by practical men. The question of electrolysis is thoroughly discussed in an article by the company's electrician, giving the results of actual tests made in the laboratory and in actual commercial practice. The volume will make a valuable addition to any technical library, and its compact size renders it especially convenient for a pocket handbook.

The Standard Boiler Company, manufacturer of the Standard watertube safety boiler, has purchased the plant of the Goshen, Ind., Machine and Boiler Works, where it will hereafter manufacture its well known boiler. The works are admirably adapted for the purpose, consisting of fully equipped machine shop, foundry and boiler shop, covering at present 22,000 square feet or floor space. The most modern special machinery for making boilers will be used. The present capacity is such that 200,000 horse-power per year can be turned out, and this capacity can easily be doubled if occasion should require it. The offices of the company will remain in Chicago, but Mr. A. W. C. Ward, vice-president of the company, will hereafter make his headquarters at Goshen, and have charge of the practical management of the works. The company is to be congratulated on this tangible evidence of a revival in business.

The Electric Storage Battery Company has recently contracted to install a battery of chloride accumulators in the Queen's Insurance Company's new building, corner of Cedar and William streets, New York city. During the day the battery will be operated as a regulator of potential, allowing the elevator and lighting services to be taken from one generator, and during the night and over holidays and Sundays the battery will furnish all the current required by the lamps and elevators. Other contracts recently closed cover batteries for supplying night lamps and elevator service in the building being erected by Messrs. Jones Bros., Brooklyn. This plant will be operated at 240 volts throughout; a battery for lighting the casemates at Fort Wadsworth; another for use in connection with the gas engine dynamo plant to be installed in St. Paul's M. E. Church, New York; a battery for night lighting and lamp testing at the lamp works at Harrison, N. J. The Commercial Cable Company is installing a battery of chloride accumulators in its new building, to be used for operating its ocean cables. Chloride accumulators are being installed upon the following named yachts: "Marietta," "Hiawatha," "Althea," "Hildegarde," and two other yachts which have not yet been named.

ELECTRICITY
Mechanics; Architectural Drawing and Designing; Architecture; Mechanical Drawing; Steam Engineering (Stationary, Locomotive or Marine); Civil, Railroad, Bridge, Hydraulic and Municipal Engineering; Plumbing and Heating; Coal and Metal Mining; Prospecting, and the English Branches.
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CONTRACTING ENGINEERS,
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New York Office, 29 Broadway.

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High-Grade Electrical Instruments of Every Description.
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Containing the names, with capital and credit ratings, of all business houses in the electrical trade in the United States and Canada.
Over 10,000 Correspondents.
Special facilities for prompt collections.
P. M. MOWREY, General Manager.

The Man Who Wanted Quiet.

A MAN went into a store and asked if he could rest four or five hours.

The proprietor, who had just found a nest of new-born mice in his coffee-grinder, told him that he could and then asked him why he didn't go to the hotel.

The man replied: "I am suffering from nervous prostration, and the doctor advised me to get a quiet place to rest, and, as I see YOU DON'T ADVERTISE, I knew that I couldn't find a quieter place."

And with that he settled back in his chair and watched the swallows build a nest in the cheese-box.

Moral: It's obvious.

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ELECTRICAL REVIEW,
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New York City....

Manufacturers and Dealers PARTRICK & CARTER CO. 125 So. 2nd St. PHILADA. PA. ELECTRICAL HOUSE GOODS.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED MARCH 23, 1897.

579,473 Electric time check and recorder; A. Davidson, New York, N. Y.—A ticket selling device, comprising a set of annunciators, ticket holders controlling the same, synchronized clocks and commutators with batteries and circuit wires arranged as described to indicate automatically to a remote station the sale of any ticket at the selling station, with a device for detecting a lack of synchronism in the clocks.

579,482 Telephonic messenger service; J. D. Hobbs, New York, N. Y.

579,511 Electrically operated sewing machine; J. S. Biggar, Chicago, Ill.—A needle holder, a pair of solenoids adapted to reciprocate the same, a rotary shuttle with a shaft upon which said shuttle is mounted, a circuit-controlling switch adapted to control the circuits through said solenoids, and a motor contained within the frame or standard of the machine adapted to rotate said shaft and the shuttle and switch mounted thereon.

579,525 System of circuits and apparatus for electric railways; Geo. Westinghouse, Jr., Pittsburgh, Pa.

579,526 Electro-pneumatic locomotive; Geo. Westinghouse, Jr., Pittsburgh, Pa.—An electric motor, a vehicle driven thereby, an air compressor, a supplemental electric motor for driving the air-compressor, a compressed-air reservoir and a fluid motor for assisting in driving the vehicle operated by air under pressure from said reservoir.

ISSUED MARCH 30, 1897.

579,556 Multiple series system of electrical distribution; F. B. Badt, Chicago, Ill.—The combination with main and compensating conductors of an undivided source of electricity from which the main conductors are led, and means adapted to respond automatically upon a variation in potential between a compensating and a main conductor, to reduce the electro-motive force of the generator.

579,582 Electric meter; George Hookham, Birmingham, England.

579,611 Electric heater; W. R. Smith, Manchester, N. H.—In an electrical heating apparatus, an electrical resistance, composed of a single jointless piece, disposed in two helices of opposite pitch.

579,634 579,635 579,636 Printing telegraph; Charles L. Buckingham, New York, and Emil Germann, Brooklyn, N. Y.

579,707 Electrical generator; S. V. Essick, Yonkers, N. Y.—The combination with a frame of an incombustible and non-conducting supporting plate, provided with orifices for receiving and holding battery cells, and provided with gutters, and an external source of heat.

579,725 Insulator and holder for electric railways; W. C. Keithly, San Francisco, Cal.

579,728 Trolley system; W. H. Walker, Pittsburgh, Pa.

579,738 Method of overcoming electric phenomena in goods; B. W. Child, Boston, Mass., and M. A Replogle, Cedar Falls, Iowa—The method of rendering normal the electric condition of paper or other material, consisting in directing upon the same a current of atmospheric air, and bringing into close proximity with the surface of such material electric conductors.

579,759 Electric railway; Frank Mansfield, New York, N. Y.—The combination of a car having double trucks, a contact device suspended therefrom, and consisting of a short conducting bar, supported horizontally beneath and between the axles of each truck, and an intermediate connecting bar hinged between said short bars.

579,760 Electric railway; Frank Mansfield, Philadelphia, Pa.

579,780 Electrical governor for marine engines; G. A. Tower, Richmond, Va.

579,808 Reflector for focusing cathode rays; R. M. Russell, Birmingham, Ala.—A focuser for cathode rays, consisting of the outer concavo-convex shell of lead or other inelastic metal, and an inner shell or lining of tin or other elastic metal.

579,877 Mould for manufacturing secondary battery plates; Frank King, London, England.

579,882 Kinetographic camera; A. Lumiere, Lyons, France—In combination, the reciprocating slide, the rotary shaft, the points operated by the slide for engaging a ribbon, the disk on the main shaft arranged to expose the ribbon at intervals.

579,929 Electrically controlled railway signal; F. McBrien, Newark, N. J.

579,933 Signaling; J. G. Schreuder, Edgewood Park, Pa.

Mr. Mason's New Appointment.

Mr. Frank C. Mason, superintendent of the police telegraph bureau, of Brooklyn, N. Y., has been appointed honorary assistant in the department of electricity at the Nashville Centenary Exposition.

Cincinnati Fire Officials Visit New York.

Among the prominent visitors to New York city last week were Louis F. Riehl, the chief electrician of the fire department and police and fire-alarm telegraph of the city of Cincinnati, and C. W. Theobald, manager of the American District Telegraph Company of that city. The gentlemen came East, representing the fire department of Cincinnati, to inspect the manufacture of underground cables, which are now in process of construction by the Safety Insulated Wire and Cable Company, of New York. This firm was recently awarded the contract for underground conductors for the fire department of Cincinnati, which is commencing to put its wires underground. The gentlemen, while in the city, visited the fire headquarters of New York, Brooklyn and Newark. While they found some new ideas, they expressed their belief that the service in their city bears a very favorable comparison to anything they have seen in the East. Cincinnati has always been famous for its well organized and thoroughly competent fire department.

MANUFACTURING NOTES.

A very attractive 16-page circular has just been received from the L. E. Knott Apparatus Company, of Boston. In this, the general problems of the influence machine seem to be discussed very understandingly, and, doubtless, the publication will prove very helpful to all interested in the subject. In the new machine, there listed, every precaution seems to have been taken to protect the working parts from moisture, and to secure easy adjustment. It can be operated either by hand-power, incandescent lighting current or water motor. The instrument seems to present many novel features never before used on any form of influence or static machine.

The Lundell fan motors, manufactured by the Interior Conduit and Insulation Company, of New York, are so well known that a description of them would seem almost superfluous. These machines have been sold all over the world, and the name "Lundell" has become synonymous with "high standard of merit". The company has placed upon the market this season several new styles of ceiling and column apparatus, and their handsome illustrated catalogue shows a varied and complete line. The "Lundell" is not a cheap affair, but is a machine well made in every particular, handsome in design and finish, and of highest obtainable efficiency. Illustrations of these fan motors are unnecessary for the reason that the general public, as well as the trade, are thoroughly familiar with their design and appearance.

New York Electrical Society.

The next meeting of the New York Electrical Society will be held at Columbia University, Madison avenue and Forty-ninth street, on Wednesday, April 7, at 8 P. M. Mr. E. E. Higgins, editor of the *Street Railway Journal*, will give an informal talk on: "A Résumé of Financial and Engineering Practice in American Street Railroading."

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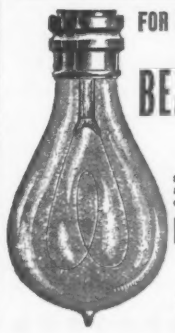

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